RONDEAU PROVINCIAL PARK

PRELIMINARY MANAGEMENT PLAN

Ontario
Ministry of Natural Resources

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INTRODUCTORY LETTER

Dear Sir or Madam:

Rondeau Provincial Park was established on May 5, 1894 and is Ontario's second oldest provincial park.

Planning for the future of Rondeau must recognize long-established traditions of use as well as the wisdom of protecting and conserving a set of unique natural resource features which are without equal in Ontario. In the mid-1970s, an Advisory Committee comprised of local citizens and citizens from surrounding areas was established to make recommendations for the future of this provincial park. The work of this committee has given guidance to the day-to-day management of Rondeau while the Ministry of Natural Resources has been dealing with a number of related issues.

We are pleased to present the Rondeau Provincial Park Preliminary Management Plan for your review and comment. This plan provides a definition of the role, significance and classification of Rondeau within the provincial park system. It contains policies and outlines zones for the planning, development, management and use of the resources and attributes of the park.

To ensure that these policies are responsive to the public interest, we are asking for your comments and suggestions. A comment sheet is enclosed for your convenience. If you have any questions, comments or would like more information, please contact:

District Manager
Ministry of Natural Resources
Chatham District
P.O. Box 1168
1023 Richmond Street
Chatham, Ontario
N7M 5L8

Telephone: (519) 354-7340

Our purpose is to complete a final plan to guide the management of the park for a term of 20 years. Your participation and input will help us in refining this preliminary plan, leading to the completion and approval of a final management plan for Rondeau Provincial Park.

The deadline for written and verbal comments is October 31, 1989.

Wendy McNab
District Manager
Ministry of Natural Resources
Chatham District

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1.0 INTRODUCTION:

Rondeau Provincial Park is located in Kent County, Ontario on Highway 51, 20 kilometres southeast of Blenheim, 20 kilometres southwest of Ridgetown and 40 kilometres southeast of Chatham (see Figure 1). The foresight of local residents and government in the previous century was responsible for the implementation of AN ACT TO ESTABLISH A PROVINCIAL PARK AT RONDEAU in 1894. Today, Rondeau Provincial Park, which comprises 3,254 hectares, is administered by the Ministry of Natural Resources under ONTARIO REGULATION 187-84 and is recognized as a significant component of Ontario's provincial park system.

The natural heritage of Rondeau provides internationally recognized opportunities for nature appreciation, including photography and bird watching. The park's environment, which includes several kilometres of beach, provides a range of recreational opportunities such as camping, fishing, boating, picnicking and hiking. The Visitor Centre houses many displays and is a focal point of the visitor services program (see Figure 2). In addition, there is a cottage community of 302 private leaseholds.

Rondeau is a popular location for area day-users as well as a vacation destination. The park provides a significant contribution to southwestern Ontario's recreational day-use and camping needs, and also makes important contributions to the other objectives of Ontario's provincial park system.

2.0 PARK POLICIES:

2.1 Classification:

Natural Environment parks incorporate outstanding recreational landscapes with representative features and historical resources to provide high quality recreational and educational experiences.

Rondeau Provincial Park is classified as a Natural Environment park in recognition of its provincially significant landforms and associated flora and fauna, as well as its capability to provide a diversity of outdoor recreational activities in an attractive natural setting.

2.2 Goal:

THE GOAL FOR RONDEAU PROVINCIAL PARK IS TO ENHANCE AND PROTECT THE QUALITY OF THE PARK ENVIRONMENT, ESPECIALLY ITS UNIQUE CAROLINIAN FEATURES, AND TO PROVIDE COMPATIBLE RECREATIONAL, EDUCATIONAL AND CONSERVATION ACTIVITIES.

2.3 Objectives:

Rondeau Provincial Park will contribute to the achievement of the objectives of the Ministry of Natural Resources' Chatham District Land Use Guidelines and the Ontario provincial park system in the following manner:

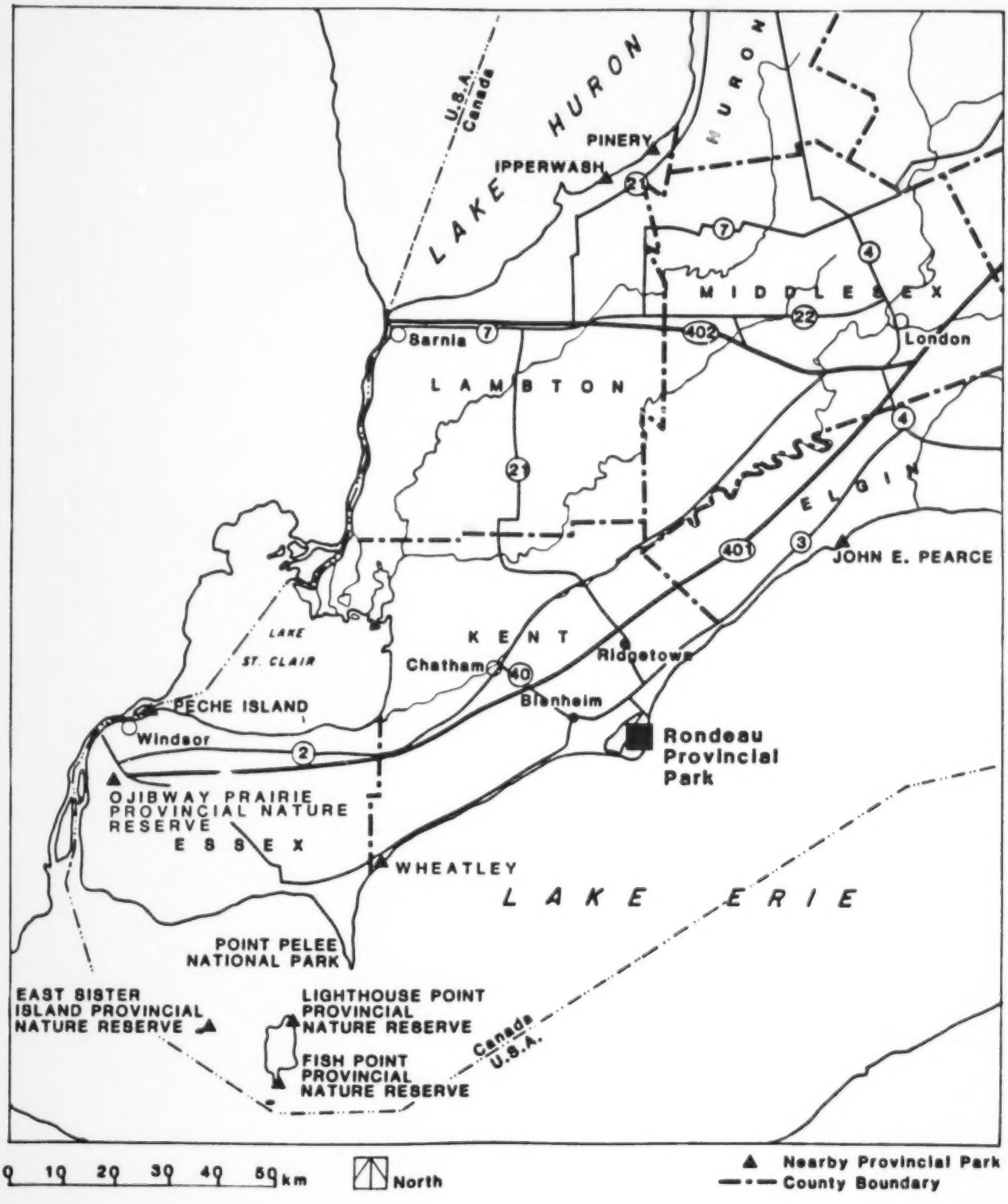
2.3.1 Protection:

TO PROTECT PROVINCIALLY SIGNIFICANT ELEMENTS OF THE NATURAL AND CULTURAL LANDSCAPE OF ONTARIO.

Rondeau is a cuspate sandspit formation supporting a "Carolinian" forest (a hardwood forest of southern character) together with significant wetland environments. This particular vegetation-landform feature is not represented elsewhere in Canada. The first priority for resource management in Rondeau will emphasize the protection of the park's natural forest, wetland and beach communities, including all associated flora and fauna. The objective will be to ensure that these provincially and nationally significant natural landscapes are not lost or degraded.

Figure 1

Park Setting



The Rondeau environment contains a number of interesting and rare species, such as tulip-tree, swamp rose mallow and lake chubsucker. Threatened species include the eastern spiny soft-shelled turtle and nodding pogonia. Bald eagles, an endangered species, regularly nest in the park.

The Rondeau forest community has become well-known as one of Ontario's outstanding natural areas. The park's ecosystem is comprised of many plant species which are typical of more southerly regions of eastern North America. Besides its impressive botanical diversity of herbaceous species, the forest also contains many imposing individual specimens of trees. Twenty-two species of Carolinian trees and shrubs occur or have occurred at Rondeau. Many wildflower species are also present.

Although representative of the eastern deciduous forest, a combination of factors specific to Rondeau and the lower Great Lakes have resulted in an ecosystem that is diverse, aesthetically appealing and scientifically unique.

2.3.2 Heritage Appreciation:

TO PROVIDE OPPORTUNITIES FOR EXPLORATION AND APPRECIATION OF THE OUTDOOR NATURAL AND CULTURAL HERITAGE OF ONTARIO.

In Rondeau, opportunities for individual exploration and appreciation of the park's unique environment will be provided by a system of access routes, including interpretive and hiking trails. The park is one of the largest natural areas in southwestern Ontario and, as such, presents admirable opportunities for visitors to gain a better appreciation of the natural history of the Carolinian Zone of southern Ontario on a year-round basis. These opportunities will be provided through visitor services programming.

2.3.3 Recreation:

TO PROVIDE OUTDOOR RECREATION OPPORTUNITIES RANGING FROM HIGH INTENSITY TO LOW INTENSITY FACILITY-BASED EXPERIENCES.

Rondeau is one of the few parks in southwestern Ontario that can provide additional camping and day-use opportunities. Currently, Rondeau's 226 campsites provide seven per cent of the Chatham district camping opportunity target identified in the Chatham District Land Use Guidelines. Two hundred and fifty additional campsites will be developed in the long term so that ultimately Rondeau's contribution to the district camping target will be about 17 per cent. These additional campsites will be developed in a variety of settings to provide opportunities for backpackers, tenters and trailer campers.

Similarly, additional day-use areas will be made available for picnicking and swimming. Rondeau's contribution to the Chatham district day-use target will rise from six per cent to about ten per cent.

Most of the additional camping and day-use facilities will be developed in the areas currently occupied by the cottage community. At present, the existing leasehold interests restrict access to the beach and lake.

In addition to picnicking and swimming, other summer season day-use activities include boating, hiking, cycling and fishing. Off-season activities include waterfowl hunting, ice fishing and cross-country skiing.

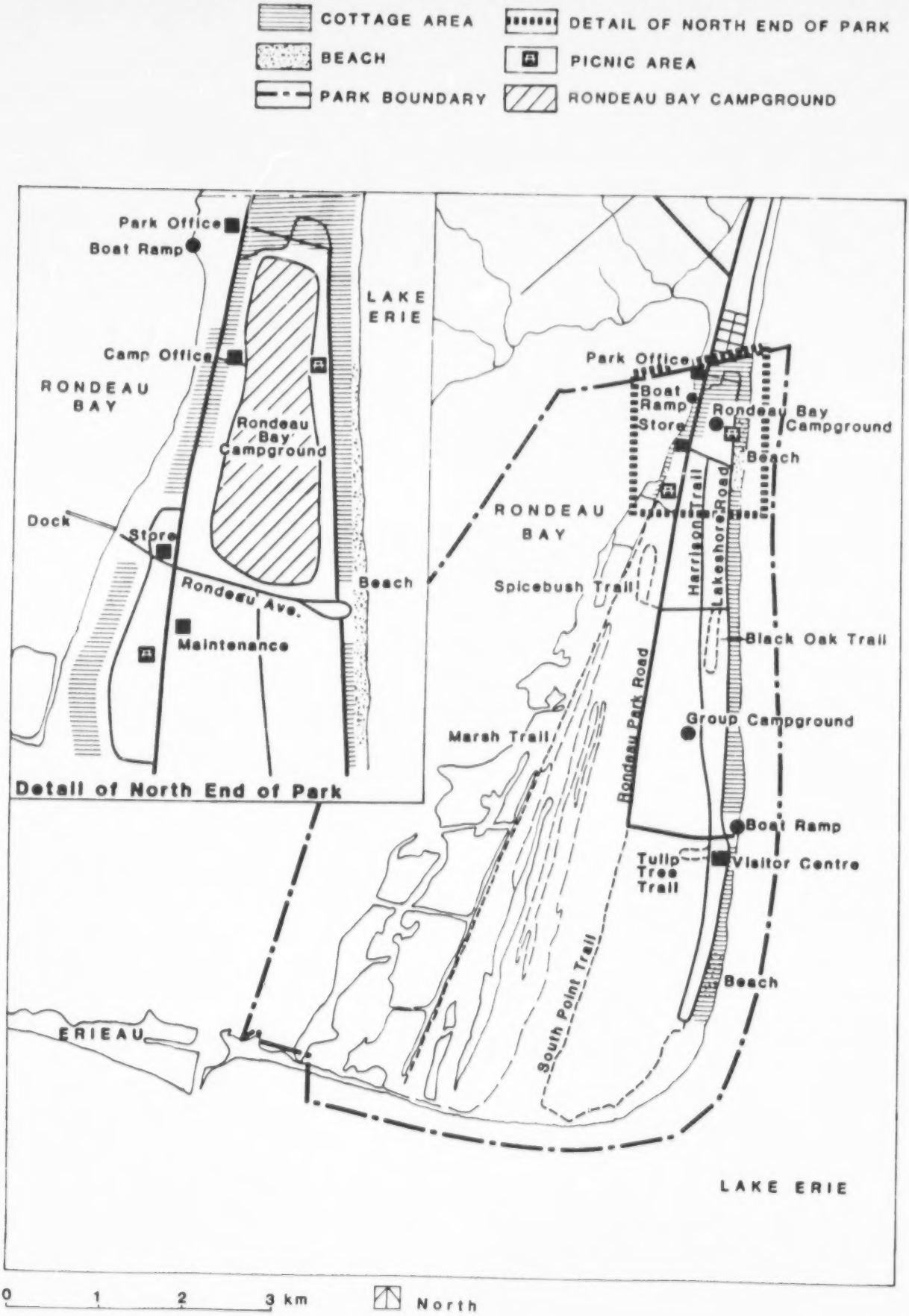
2.3.4 Tourism:

TO PROVIDE VISITORS WITH OPPORTUNITIES TO DISCOVER AND EXPERIENCE THIS DISTINCTIVE REGION OF THE PROVINCE.

The natural and cultural heritage

Figure 2

Park Features and Present Development



values both in Rondeau and the surrounding area attract visitors from considerable distances. Seventy per cent of Rondeau's visitors are from southwestern Ontario, Michigan and Ohio.

2.4 Park Boundary:

Prior to 1984, all of Rondeau Bay was included within the park boundary. The current park boundary is shown in Figure 3. No changes to this boundary are planned. The portion of Rondeau Bay outside the boundary is administered under the Ontario Public Lands Act.

2.5 Park Zoning:

The park zoning for Rondeau as provided for in this plan is shown in Figure 3. This zoning provides for the eventual planned major additions to the camping and day-use facilities and roadways when cottage sites become available.

Zoning of the landbase and wetlands of Rondeau ensures that these areas are allocated to their most appropriate use relative to the resource values requiring stewardship.

2.5.1 Development Zones (423 hectares):

Development Zones provide for facilities and services for a range of day-use and camping activities. Within such zones, all maintenance and development activities will be carried out with special care for the environment. The cottage community occurs in zones D1 and D2.

North End Development Zone D1

This zone includes the park entrance and contains the main day-use and camping areas as well as administration and maintenance facilities. Further development of day-use and camping facilities in this zone will occur as cottage sites become available (see Section 4.6).

Lake Erie Development Zone D2

Currently, this zone contains the Visitor Centre, a small day-use area and a boat launch facility. As cottage sites become available, this zone will contain the future Lake Erie Campgrounds and the new group camping area (see Section 4.6 and Section 4.3.1).

Pointe aux Pins Development Zone D3

This zone at the south end of the park is designated to accommodate a walk-in campground which will be designed to provide low-density, rudimentary camping opportunities for backpackers.

2.5.2 Access Zones (293 hectares):

These zones serve as public or service vehicle travel routes and provide visitor access to the significant natural environment of the park. These zones include the roads and a 30 metre strip on both sides.

Marsh Road Access Zone A1

This zone provides access to the Rondeau marsh facilities and activities.

Rondeau Park Road, Gardiner Avenue and Lakeshore Road Access Zones A2, A3 and A4

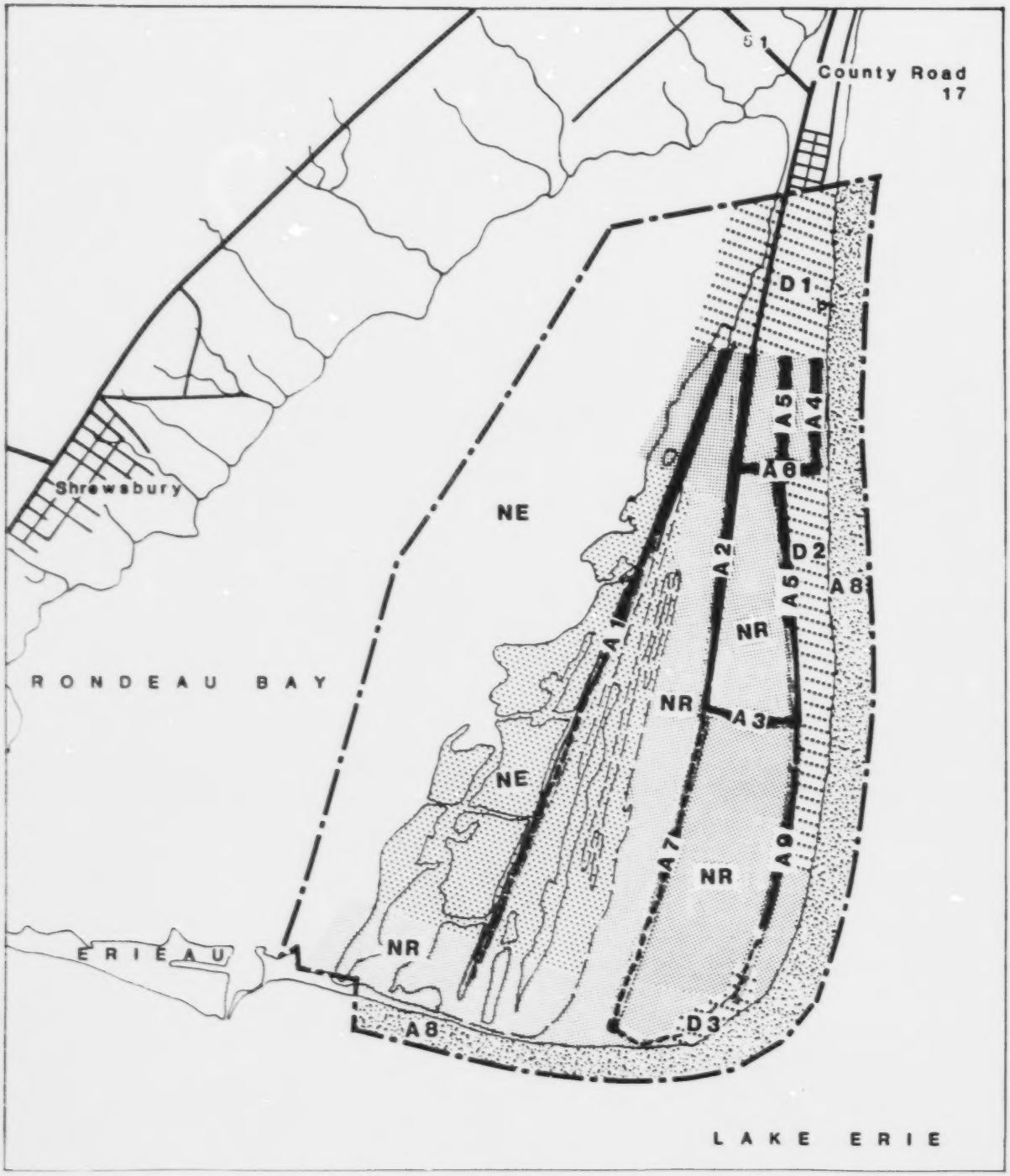
These three zones provide the main access to the visitor centre, the interpretive and hiking trails through Rondeau's southern hardwood forest and the Lake Erie and Pointe aux Pins Development Zones.

Harrison Trail, Bennett Avenue and South Point Trail Access Zones A5, A6, A7 and A9.

These four zones provide secondary access to the Lake Erie and Pointe aux Pins Development Zones and

Figure 3

Park Boundary and Zoning



to the interpretive trails through the southern hardwood forest. Zones A7 and A9 are restricted to pedestrians, bicycles and service vehicles.

Lake Erie Access Zone A8

This zone includes the waters of Lake Erie within the park boundary which extends 150 metres out into Lake Erie. It provides water access to the park's Lake Erie shoreline.

2.5.3 Natural Environment Zone NE (1,432 hectares):

This zone is extensive in area and includes most of the marsh and bay that is within the park boundary (See Figure 3).

The Rondeau marsh is a significant feature of the park and this zone, together with the adjacent portions of the Nature Reserve Zone, is designated to provide long-term stewardship of the marsh. The old dredge cuts and dykes in the marsh have become an established feature. These will be managed for the recreational access and the additional wildlife habitat which they provide.

Day-use fishing opportunities and fall waterfowl hunting opportunities are provided in this zone. Much of the area requires little or no management. However, monitoring of marsh vegetation and fisheries and waterfowl habitats will occur and results from these could indicate a need for some future management (see Section 3.3).

2.5.4 Nature Reserve Zone NR (1,106 hectares):

This zone is designated to provide long-term stewardship and protection of the natural and least disturbed areas of Rondeau's Carolinian forest and wetland environments. Protection and stewardship of this zone will entail active management of Rondeau's deer herd in order to restore a balanced ecology.

Deer population control is essential to the objective of this zone (see Section 2.3.1 and Section 3.3.3).

The waterfowl hunting opportunities which have been occurring within the marsh area of this zone will be relocated to the Natural Environment Zone (see Section 2.5.3).

Opportunities for visitor appreciation of this significant environment will be provided by interpretive and hiking trails.

3.0 RESOURCE MANAGEMENT:

Rondeau will be managed in accordance with the general planning and management policies for Natural Environment class provincial parks.

Resource management strategies are required to recommend specific management techniques or practices for vegetation (see Section 3.2) and fauna (see Section 3.3). In addition, monitoring of vegetative changes (see Section 3.2.2) as well as faunal populations and their changes (see Sections 3.3 and 3.3.3) is required. These planning, surveying and monitoring needs are inter-related. This will be recognized when undertaking these activities.

Additional direction to meet a number of special resource management requirements within Rondeau is as follows:

3.1 Water:

3.1.1 Quality:

The need to ensure good water quality for the park's many visitors requires that drinking and bathing water be monitored on a regular basis using approved testing techniques.

3.1.2 Levels:

Lake Erie's water level and currents greatly affect the natural environment of Rondeau. As the lake's level rises and falls, habitat changes occur both within Rondeau Bay and the many sloughs throughout the park. As these fluctuations are naturally occurring, no attempt will be made to control water levels in Rondeau Bay or in the sloughs.

All developed areas, facilities and roads will be maintained to ensure that natural drainage patterns are not affected.

3.1.3 Erosion:

Lake Erie's near-shore currents, influenced by the Erieau pier located west of the park, have caused severe erosion along the south beach. This process will be monitored to document and assess the impact on the south beach and ultimately on the bay and marsh. Strategies for minimizing the lake's effect may be necessary.

3.2 Vegetation:

3.2.1 Vegetation Management Principles:

The primary principle of vegetation management in Rondeau is to perpetuate the natural succession of plant communities native to the park and representative of its geographical location. This management principle can best be achieved by allowing Rondeau's plant communities to change naturally through time.

An additional principle is to protect rare, threatened and endangered species and those naturally occurring species that are representative of this southerly area of Ontario.

A vegetation management strategy will be prepared to recommend specific management techniques for fulfilling these principles and providing guidelines for the vegetation issues that follow.

3.2.2 Vegetation Management Issues:

Flora Extraction:

The protection of rare, threatened or endangered floral species may require the extraction, or removal, of some species of vegetation.

The vegetation management strategy may specify areas where vegetation may need to be removed to enhance the regeneration of particular plant communities or species. Logging for commercial purposes will not occur in Rondeau Provincial Park.

Removal of plants by the general public is prohibited. Collections for approved botanical or research purposes may be carried out by ministry staff or with ministry approval provided that such collections do not threaten a plant population's viability.

Vegetation Monitoring:

Detailed botanical inventories are required for the Nature Reserve and Natural Environment Zones, and in Development Zones prior to development. Additional inventories will map and quantify changes in vegetation over time throughout the park. The inventories will be used to measure the effectiveness of implemented specific management techniques and to monitor the response of vegetation to deer population control (see Section 3.3.3).

Hazardous Trees:

Hazardous trees are those which may cause property damage or personal injury due to their failure.

Hazardous tree identification and management guidelines have been prepared for Rondeau to guide the implementation of this safety program.

The following policies will govern

the treatment of hazardous trees:

Public Roads, Service Roads and Parking Lots: hazardous trees within 30 metres of the edge of a public road or parking lot may be felled and salvaged;

Trails: hazardous trees that threaten the safety of trail users may be felled. Only that portion of the tree that lies on the trail may be cleared. No material will be salvaged unless prescribed in the vegetation management strategy;

Development Zones: hazardous trees and those impeding development will be felled and salvaged.

Vegetation Planting:

Only indigenous species will be planted. Plantings in general will be restricted to the heavily used portions of the Development Zones where natural regeneration methods are too slow or uncertain. Examples include vegetative buffers, screens, shade trees and ground cover in the day-use, campground and beach areas. Plantings will not occur in other zones unless prescribed by the vegetation management strategy or as part of an approved scientific research program.

Cottage Lot Rehabilitation:

As cottages are removed, natural regeneration methods will be favoured where possible. Artificial regeneration methods such as the seeding and planting of indigenous species may be used where required to assist or accelerate the regeneration process.

Non-Native Species:

Additional non-native species will not be introduced. Existing introduced species will be managed as follows:

a) if an introduced species is reproducing, it may be controlled or eliminated where feasible by the most environmentally sound method available;

b) if the introduced species is not reproducing, it is not considered a threat to indigenous plants. It therefore can either be left to die out naturally or it may be removed.

Noxious Weeds:

For the public's protection, poison ivy may be controlled as required in the Development Zones or along trails.

Insects and Disease:

Native insects and diseases that attack the vegetation in the park will normally be allowed to develop undisturbed. However, those insects and diseases which threaten values within the park for which the park has been established, aesthetic values within the Development Zones or values outside the park will be controlled where feasible. Insects and diseases not native will be controlled where feasible and necessary. Where control is undertaken, it will be directed as narrowly as possible to the specific insect or disease so as to have minimal effects on other components of the park's environment. Attempts will be made to prevent insect introduction into the park and to eliminate them before they become established. Biological control will be used wherever practicable.

Chemicals:

The use of chemicals within the Development Zones to control, protect or promote vegetation will be kept to the absolute minimum and used only if alternative methods are not feasible. Chemicals may be necessary to control noxious weeds, to repel animals from plants, to kill unwanted stumps or to fertilize vegetation in heavy use areas. The use

of chemicals outside the Development Zones will not occur unless required under exceptional circumstances.

Grass Cutting:

Mowing will be carried out as required in the Development and Access Zones for aesthetic, access and safety purposes in the day-use, campground, beach access areas and along roads.

Fire Suppression:

All fires will be controlled. Prescribed burns for management purposes may be considered. Direction will be provided in the vegetation management strategy. Fire protection for structures within the Development Zones is provided by agreement with the Township of Harwich.

Dune Protection:

Due to the sensitive nature of sand dunes, stabilization and rehabilitation measures may be undertaken if required (see Section 4.3.2).

3.3 Fauna:

Consistent with the principles for vegetation management, the main objective is to ensure that Rondeau continues to harbour the rare, threatened and endangered species and other indigenous faunal species representative of this southerly area of Ontario. A wildlife management strategy will be prepared to recommend specific management techniques for fulfilling this objective and to expand upon the issues that follow below. A comprehensive survey of faunal populations must be undertaken to identify significant species and habitats in the park.

3.3.1 Waterfowl:

Waterfowl hunting will be permitted in the marsh area of the Natural Environment Zone only. Within this zone, hunters must hunt from locations designated by the Ministry of Natural Resources.

Waterfowl hunting in Rondeau is governed by regulation under the Ontario Game and Fish Act and is managed according to the Rondeau Waterfowl Management Unit Operating Plan. This plan guides the management of waterfowl hunting in all of Rondeau Bay.

3.3.2 Trapping:

Management trapping of muskrats in order to minimize damage to the base of the marsh roads, caused by muskrat burrowing, will be permitted within the Natural Environment and Marsh Road Access Zones under the supervision of the Ministry of Natural Resources.

No other forms of trapping will be permitted in the park except for very specific management reasons (see Section 3.3.4).

3.3.3 Deer:

Deer are a natural and interesting part of the Rondeau ecosystem. However, Rondeau presently has an unnaturally high deer population and this is having undesirable effects on the park's unique forest vegetation.

Man's activities in and around Rondeau have changed habitat conditions, often to the deer's benefit, through past timbering, land clearing and agricultural practices. In addition, most natural predators have been eliminated. This has led to an extremely large number of deer for a forest ecosystem the size of Rondeau's. In 1989, the winter population count was 489, or about 45 deer per square kilometre of forested habitat.

In 1975 the Rondeau Provincial Park Advisory Committee recommended in its final Policy Recommendations

Report to the Minister of Natural Resources that deer control programs not be re-introduced for a three-year experimental period until additional studies could be carried out. A number of additional studies have now been completed.

Recent research by Dr. T. Carleton and Mr. E. Haggith of the University of Toronto and by the Ministry of Natural Resources has confirmed earlier scientific studies that deer are having a serious impact on the composition and structure of the Rondeau forest.

In the Ministry of Natural Resources' study, two plots of approximately one-fifth hectare in size were fenced to exclude deer. For five years, the response of the vegetation was monitored and compared to similar "control" areas to which deer had free access.

The results contrasted dramatically. Growth inside the fenced areas was lush; Carolinian tree species such as tulip-tree proliferated and grew rapidly. In the unfenced control plots, tulip-trees also regenerated well, but their growth was severely restricted by deer browsing. Only two saplings managed to grow into the lower canopy out of reach of the deer. The rest remained stunted because their main growing shoot was repeatedly nipped off.

The University of Toronto study compared tree species composition between the understory and the canopy, and examined the age composition of trees in several areas of the park. Both lines of evidence indicated that the composition of the forest is changing and will continue to change. There was a marked scarcity of seedlings of several desirable Carolinian species which contribute significantly to Rondeau's diversity and appeal. The researchers predicted that shagbark hickory, black walnut, white pine, black cherry, white oak, red oak, black oak and sassafras would eventually be eliminated from the Rondeau forest. The primary reason why these species have not been replacing themselves in the canopy was identified as excessive browsing on seedlings by deer.

Deer seem to have found these tree species more palatable than others. As a result, the less palatable ones, such as hop hornbeam, blue beech and spicebush, are placed at an advantage in their survival. The two studies indicated that these less palatable species will therefore become dominant in large sections of the park. Furthermore, they will tend to form a dense canopy that resists change and impedes regeneration of the Carolinian species.

Presently there are abundant large openings in the forest due to the blowdown of large trees, caused by severe wind and ice storms in recent years. This is a naturally re-occurring process. These are the very conditions required for optimum regeneration and growth of many of the important Carolinian species.

However, a combination of the direct effects of browsing on seedlings of these species, together with the gradual changes in species composition caused indirectly by deer, is adversely altering the forest that helps make Rondeau so well known.

A separate ministry study has looked at the herbaceous vegetation, with special emphasis on spring wildflowers such as trilliums. In the fenced areas, species diversity was greater, the size of individuals was larger and the number of individuals was greater when compared with the poorly developed vegetation in the adjacent, unfenced control areas. All evidence indicates that the deer are having a major impact on the herbaceous vegetation as well.

A ministry radio-telemetry study of deer has been underway for three years. Evidence suggests that the majority of deer essentially remain within the park boundary all year rather than moving out in the spring and summer months as was previously thought to be the case.

It is apparent from all of this research that a management strategy is required in order to achieve a balance between the number of deer in Rondeau and the quality of the forest to be protected. The goal must be to achieve a population level of deer that once again permits the growth of Carolinian species into the forest canopy. This requires artificially reducing the number of deer in the park and then controlling the population at a level that allows enough vegetative regeneration to perpetuate Rondeau's Carolinian forest.

Based on research and scientific knowledge, that level has been determined to be approximately 100-125 animals (refer to Appendix I for a discussion of the Charles O. Bartlett report and to Appendix II for the research by Dennis R. Voigt and J.D. Broadfoot). The deer herd will be reduced to this approximate size from the 1989 population level of 489 animals.

Ongoing monitoring studies will continue to be carried out in order to measure the response of the forest to the reduced deer population. Similarly, a deer monitoring program will be designed and implemented to monitor population and biological changes within the herd.

The need to control deer is not new to Rondeau or indeed to other parts of North America where predators have been eliminated and deer hunting is not permitted. Deer control was first proposed in Rondeau in 1911 due to browsing damage to the vegetation. In the ensuing years, sporadic deer control through shooting by Ministry of Natural Resources' staff occurred, accompanied by improved regeneration, and then renewed reports of deer damage when control efforts slackened.

The Ministry of Natural Resources has considered a number of deer management control options including fencing, capture and relocation, scientific collection, introduction of natural predators, a controlled public hunt and population reduction by a cull (shoot) carried out by ministry staff. These options and others are described in more detail in the accompanying discussion paper (Appendix I).

Having considered the advantages and disadvantages of all of these management options, it has been determined that shooting is the most efficient and only practical method of reducing the deer population and maintaining it at a desirable level. This will be undertaken solely by Ministry of Natural Resources' staff as recommended by the Rondeau Provincial Park Advisory Committee or there may also be some participation by the public in the cull process as discussed in 5.12 and 6.1 of Appendix I.

Once the optimum deer population level is reached, the herd must be maintained at that level through annual culls in order to prevent a recurrence of the present situation. The best available knowledge will be used to plan and initiate the control program as quickly as possible.

3.3.4 Nuisance Animals:

Within the Development Zones of Rondeau (see Section 4.6) some nuisance animal control may be necessary (for example, removal of skunks from under cottages). However, in the long run, reducing the potential for conflict between indigenous animals and man will be emphasized.

The main strategy for achieving this

will be through providing information about wildlife habits to park visitors (see Section 4.1).

Feral animals are not a part of the natural community of Rondeau and they will be removed or destroyed under the supervision of the ministry.

3.4 Fisheries:

Commercial fishing and bait fishing are permitted within the park boundary on Lake Erie where it does not interfere with recreational activity. Rondeau Bay is closed to commercial fishing except for a few existing commercial bait fishing licences. These licences will be honoured in a continuing effort to offset shortages of bait fish supply in July and August experienced by the Rondeau area tourist-related sports fishing business. Careful periodic monitoring of the Rondeau Bay bait fish catches will occur to ensure that panfish, yellow perch, large-mouth bass, other sport fish and rare fish such as the lake chubsucker are not being taken.

Recreational fishing will be encouraged. Bait fish indigenous to the area may be used. Coarse fish may be taken in accordance with federal and provincial regulations but not with a bow and arrow. Ice fishing, including the use of fishing huts, will be permitted but all structures must be removed from the ice prior to ice break-up. Open fires on the ice will not be allowed within the park.

In Rondeau Bay, fisheries management programs should be undertaken only after studies indicate such programs will benefit the existing fishery. Fish management programs will be consistent with the Chatham District Fisheries Management Plan.

Good water quality is important to maintain this warmwater fishery. The ministry will encourage measures to improve the water quality and rehabilitate fish habitat.

3.5 Cultural Resources:

The cultural resources of Rondeau contribute to the history of Ontario. An inventory of sites and findings will be maintained at the park and their interpretation will be included as part of the Heritage Appreciation objective of the park. Some examples of cultural themes are: use by Indians for fishing and hunting, landmark for early travellers, a site for early fisheries and a cottage resort community.

Periodic monitoring will be undertaken and, if needed, particular preservation strategies will be prepared. Prior to future development a cultural services inventory will be undertaken. Any artifacts discovered during future development will be preserved.

4.0 OPERATIONS POLICIES:

In Rondeau, the visitor is to be provided with quality services that enhance public outdoor recreation and heritage appreciation opportunities.

A park operating plan will direct staff on the day-to-day operation of the park. This plan will include information and direction for budgeting, staffing, maintenance, enforcement and emergency services. It will be consistent with Ontario provincial park operating standards and will be reviewed and updated annually.

4.1 Visitor Services:

The visitor services program will provide visitors with the opportunity to gain an understanding, awareness and appreciation for the natural and cultural resources of Rondeau. As well, this program will serve to provide visitors with information about the many varied re-

source management programs of the Ministry of Natural Resources. This will be achieved through the guidelines outlined in the following components:

4.1.1 Information:

Information concerning the park resources, management, facilities and programs, and nearby points of interest will be available at key points throughout the park. Information will be provided by a park leaflet, a tabloid newspaper, signage and special publications as required.

4.1.2 Interpretation:

The interpretive component will be directed towards all visitors to the park. Its primary objective will be the interpretation of the biological, physical and cultural features of the park within the regional and provincial context.

The following themes will be emphasized:

- biological: for example, the southern hardwood or Carolinian forest, the forest/deer relationship, marsh, beach dunes and associated significant flora and fauna;

- physiographical: for example, the shoreline processes of erosion and deposition which are presently occurring along the Lake Erie shoreline;

- cultural: for example, the role of Rondeau in the fisheries of the Great Lakes and the importance of the area as a recreational resort.

The interpretive program will be delivered primarily from the Visitor Centre where exhibits, demonstrations and audio visual shows will be made available.

The visitor services program at Rondeau will encourage groups to make the best use of the park's resources and facilities for outdoor education. Emphasis will be placed on providing leaders with the information necessary for them to conduct successful outings in the park.

4.1.3 Outdoor Recreation:

Outdoor recreation programming will focus on year-round activities. Park staff will endeavour to inform visitors of the recreational opportunities in the surrounding areas as well as in the park.

4.2 Research:

The diversity of flora, fauna and their habitats at Rondeau as well as the extent of recreational activities available provides numerous opportunities for scientific research.

All research will require the approval of the ministry and will be encouraged in order to gain a greater understanding of the natural and cultural values of the park. Recreation research will also be encouraged to evaluate the suitability of present programs, the satisfaction of park users and visitor activity patterns. Research priorities include:

- management and population dynamics of rare, threatened and endangered species;

- deer ecology and the response of vegetation to deer population control;

- the role of fire in maintaining the marsh and prairie communities in Rondeau;

- a quantitative faunal inventory;

- ecological studies of individual species;

- user perception and attitude sur-

veys;

- archaeological inventory and analysis.

4.3 Recreation Management:

4.3.1 Camping:

Currently 226 campsites are provided in the Rondeau Bay Campground, in addition to a two-group, Group Campground facility (see Figure 2). An additional 250 campsites are projected to be added to Rondeau, as identified in the Chatham District Land Use Guidelines. These additional campsites will be made available as a result of redevelopment of the existing Rondeau Bay Campground and development of the new Lake Erie Campground, Pointe aux Pins Campground and group camping area (see Section 2.5.1 and Figure 4) after existing cottage sites become vacant.

Facilities for trailer camping and electrical hook-ups on approximately 50 per cent of the sites will be provided in the Rondeau Bay Campground. The Lake Erie Campground will offer tenting facilities while the small Pointe aux Pins Campground will be designated for backpackers.

All of the campgrounds will be serviced with vault toilets, centralized garbage pick-up and water supply. Comfort stations, showers and laundry facilities will be available at the Rondeau Bay and Lake Erie Campgrounds. Services in all campgrounds may be altered from time to time to reflect the needs of park users.

4.3.2 Day-Use:

The park offers a variety of day-use opportunities throughout the year, such as boating, canoeing, sailing, fishing, skating, wildlife viewing and waterfowl hunting. Recreational snowmobiling is not permitted on the land base of the park.

Specific portions of the Lake Erie shoreline will be managed as day-use swimming and picnicking areas (see Figure 4). Vault privies, centralized garbage pick-up and picnic tables will be provided. Where necessary, boardwalks will provide convenient visitor access to the beach while minimizing erosion to the dune area (see Section 3.2.2). Day-use areas will be more clearly separated from the camping areas to provide a quieter camping environment.

4.3.3 Boating:

Recreational boating within the park boundary will be restricted to those activities that are compatible with the safety and enjoyment of other park users. Separate launch facilities will provide access to both Rondeau Bay and Lake Erie.

The natural fluctuation of water levels and aquatic growth within Rondeau Bay will influence recreational boating. These natural processes will not be managed within the park boundary.

4.3.4 Tennis Courts:

Providing that the existing courts are utilized sufficiently, they will be retained.

4.3.5 Trails:

A number of hiking, bicycling and interpretive trails totalling approximately 20 kilometres provide generally good access to the facilities and/or natural features throughout the park (see Figure 2). However, extensive upgrading of previously used trails (e.g. Dillon Trail), expansion of existing interpretive trails (e.g. Spicebush Trail and Marsh Trail loop) or addition of new trails (e.g. a fitness trail in the North End

Development Zone) will be considered in order to provide greater opportunities to explore and appreciate the park's environment. In some cases, extensive boardwalks and observation platforms will be incorporated. Where practical, these trails will be designed for the handicapped.

4.3.6 Bay Side Centre:

The present store area (see Figure 2) will be redesigned (see Figure 4) to function as a social centre for the park and will encompass such features and services as:

- bicycle rental;
- firewood distribution;
- food outlet;
- boat rentals (paddle boats, canoes);
- fishing gear rentals and sale of bait.

The Bay Side Centre will also include displays and information services to inform visitors about park features, local points of interest and local activities.

4.3.7 Roads and Parking Areas:

The road network will be redesigned (see Figure 4) to provide safer and more enjoyable access to the park features and facilities. Redundant or duplicate roads will be closed and revegetated.

Well-located and defined parking areas will be established to enhance convenient access to beach and picnic areas, trails and other day-use facilities.

4.4 Marketing:

The marketing of Rondeau Provincial Park will hinge upon the concept of providing increased public awareness of its provincially significant features, improving local economic impact through increased park use and encouraging park use as is appropriate. Marketing of Rondeau will also include increased involvement with the commercial sector by encouraging park users to take advantage of local services and attractions.

Rondeau is a vacation destination for many visitors. Over 66 per cent of the camping visitors stay four days or more.

A marketing strategy will be prepared to promote Rondeau and the surrounding area and to attract more visitors from other parts of Ontario.

4.5 Tourism Services:

Should a demand develop for additional commercial services in the area (such as hotel/motel, restaurants, etc.), it should be directed towards existing municipal or commercial development areas outside the park. Such development should be undertaken by the private sector.

All commercial services established within the park boundary will be those required to provide service to the park users. Special care will be taken to minimize conflict with services available from the private sector located in the Rondeau area. All commercial services within the park operated by the private sector will be provided through contractual agreements.

4.6 Leasehold Interests:

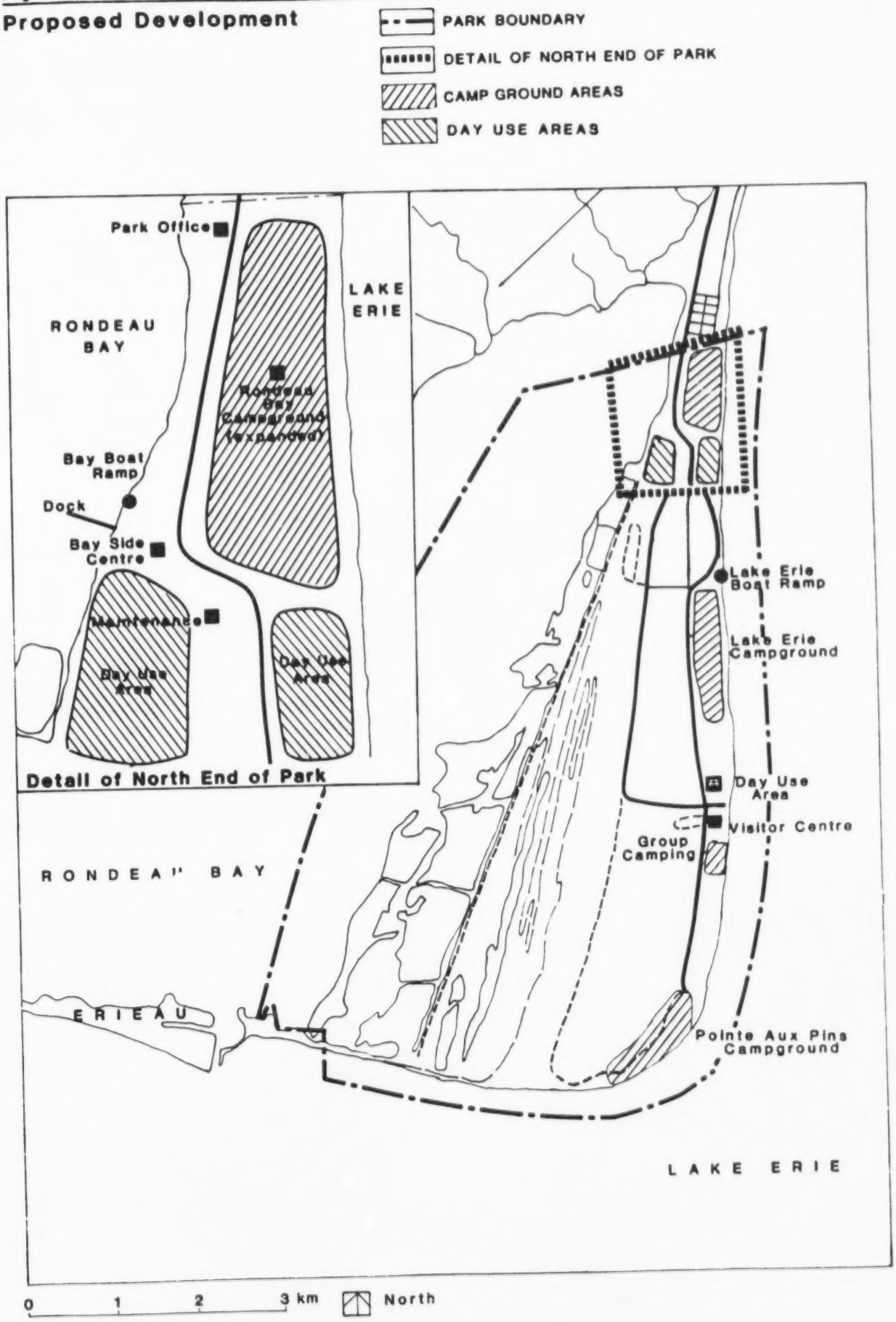
Cottages:

Cottages were introduced into Rondeau Provincial Park during the 1890s and have existed on the basis of a twenty-one year lease of a cottage lot with right of renewal. A cottage leasehold situation exists in the provincial park system only in Algonquin and Rondeau Provincial Parks.

In 1986, as a result of recommendations put forth by the Ontario

Figure 4

Proposed Development



Provincial Parks Council, a policy was approved whereby leaseholders were given the opportunity to extend their leases to December 31, 2017 through a lease-amending agreement. In 1989 there are 302 cottage leases in the park.

The Ministry of Natural Resources will attempt to acquire cottages on a priority basis as they become available and as funds permit in order to implement future development plans (see Figure 5).

Existing Church Buildings:

The existing Anglican and Roman Catholic church buildings within the park will be administered under the terms of an annual land-use permit.

Provided that there is support and interest and that the buildings are maintained in a good state of repair, these church organizations will be granted permit renewals.

Yacht Club:

The Rondeau Yacht Club will be allowed to operate until December 31, 2017 provided that it has sufficient membership support to maintain the associated structures in a safe and appealing condition. The Rondeau Yacht Club will be administered under the terms and conditions of annual land-use permits.

4.7 Pointe aux Pins Light:

The light beacon, located on the southeast beach, is a valued reference point for Lake Erie navigation. This light is managed by the Federal Government.

4.8 Emergency Services:

A park emergency plan has been prepared and provides direction regarding human safety and evacuation. This plan is reviewed yearly and will require periodic updating as park redevelopment proceeds.

4.9 Law Enforcement:

The focus for enforcement will be on providing a pleasurable experience for all park users and protecting the natural environment of Rondeau. The emphasis will be to ensure that all visitors respect park values and the rights of fellow park users. The enforcement program will be carried out in accordance with Ministry of Natural Resources' policies, acts and regulations and the Chatham District Enforcement Plan.

5.0 DEVELOPMENT PRINCIPLES:

The principles that will guide future development in Rondeau are as follows:

- upgrading of the facilities and realigning the road network within the North End Development Zone to improve the camping experience and to separate day-use from camping activities will be the initial development priorities;

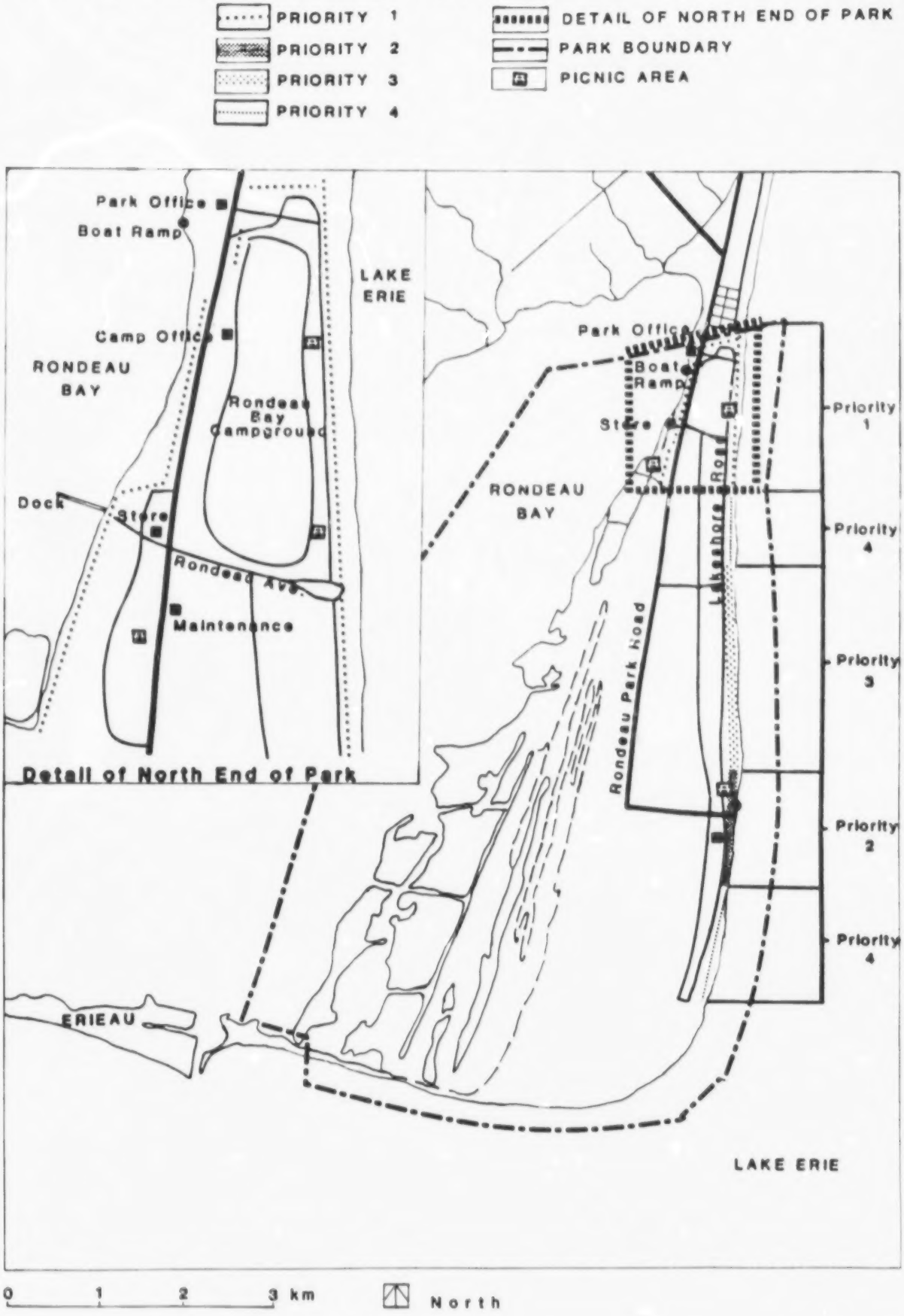
- where cottages have already been removed from areas proposed for redevelopment, the redevelopment work will proceed in step with the upgrading of the existing facilities in the North End Development Zone. This will permit the phased relocation of day-use facilities away from Rondeau Bay Campground and help reduce conflicts in the use of the park;

- design plans and site plans will be completed and approved in advance of all redevelopment, new development or upgrading of facilities and services;

- the design for all development or upgrading of facilities will emphasize efficient maintenance

Figure 5

Priority Areas for Cottage Acquisition



and operation such as the use of low maintenance materials, energy conserving designs, low staffing requirements, and ease of access. In addition, emphasis will be placed on the attractiveness of facilities and the convenience for use of them by all visitors, including the handicapped. Repaving of paved roads and paving of key unpaved roads will be an ongoing activity.

All facilities and services will be upgraded or designed to meet both provincial park standards and applicable building codes. Main roads and day-use parking areas will be paved. Secondary roads and internal campground roads and parking areas do not require paving.

6.0 IMPLEMENTATION SCHEDULE:

This management plan will be reviewed every ten years following its approval or as the need arises. Data collection and environmental monitoring will be conducted regularly.

The day-to-day maintenance of the park is guided by the superintendent's Park Operating Guidelines which will be updated as this management plan is implemented.

Implementation of this plan is divided into five phases in order to provide guidance for preparing annual park operating and work plans. These phases recognize the interrelationships between the various development needs. For example, this management plan requires redevelopment of the existing campground and the addition of two new camping areas. These depend upon an orderly removal of the cottages, realignment of portions of the park's road system and relocation or upgrading of certain facilities.

The implementation schedule is as follows:

6.1 Phase 1:

6.1.1 Development:

- upgrading of entrance signage and interim improvement to the park entrance control system;
- re-alignment of existing campground roads to permit improved access to facilities;
- upgrading of existing campsites and associated facilities in the Rondeau Bay Campground (posts, fire pits, additional electrical hook-ups, etc.);
- construction of vault privies to service the Lake Erie day-use area;
- converting the north end park facilities to natural gas for energy supply (office, washrooms, warehouse, etc.);
- establishing boat launching facilities to improve access to Rondeau Bay and the marsh, and upgrading the associated parking lots;
- continuing the rehabilitation of vacated leasehold sites;
- development of a marketing strategy.

6.1.2 Resource Management:

- preparation and implementation of a deer population control program;
- preparation of a vegetation management strategy;
- preparation of a wildlife management strategy;
- undertaking a cultural resources inventory prior to development.

6.2 Phase 2:

6.2.1 Development:

- establishing the Pointe aux Pins

Campground and associated facilities (tables, fire pits, site markers, travel routes, vault toilets, water supply, etc.);

- upgrading Dillon Trail and Spicebush Trail and associated facilities (parking lot, boardwalks, trail guides, observation tower);

- upgrading the existing Visitor Centre (including construction of new displays, improvement of energy efficiency, an expansion to include proper theatre and projection facilities);

- construction of a new entrance and/or camp office control centre (includes re-alignment of roads and campground entrance in North End Development Zone);

- continuing the rehabilitation of vacated leasehold sites.

6.2.2 Resource Management:

- establishing a Lake Erie shoreline monitoring program;

- implementing the vegetation management strategy;

- controlling deer population levels;

- implementing the wildlife management strategy;

- preparation of a marketing strategy.

6.3 Phase 3:

6.3.1 Development

- construction of an adventure playground in the Lake Erie Development Zone;

- construction of a fitness trail;

- construction of a portion of Bay Side Centre (bike rental, firewood, food, display area);

- continued rehabilitation of vacated leasehold sites.

6.3.2 Resource Management:

- continued control of deer population levels and the various monitoring programs.

6.4 Phase 4:

6.4.1 Development:

- completion of the expansion of Rondeau Bay Campground and associated facilities (tables, site markers, travel routes, washrooms, etc.);

- relocation of the trailer dumping and filling station and rehabilitation of old sites to intended use;

- construction of vault privies in Rondeau Bay day-use area;

- completion of Bay Side Centre facilities;

- upgrading the maintenance compound to reflect needs;

- removal of present Rondeau Bay day-use washrooms and rehabilitation of the site to intended use;

- continued rehabilitation of vacated leasehold sites.

6.4.2 Resource Management:

- continued control of deer population levels and the various monitoring programs.

6.5 Phase 5:

6.5.1 Development:

- establishing a group camping area and associated facilities;

- construction of a revised public road system and the rehabilitation

of old system to intended use;

- construction of Lake Erie boat ramp and associated facilities (parking lot, ramp);

- removal of existing Lake Erie ramp location and rehabilitation of the site to intended use;

- completing construction of Visitor Centre day-use area and associated facilities expansion (parking lot, tables, barbecues, etc.);

- construction of Lake Erie Campground and associated facilities.

6.5.2 Resource Management:

- continued control of deer population levels and the various monitoring programs.

7.0 SUMMARY OF THE RONDEAU PROVINCIAL PARK PLANNING PROGRAM:

In February 1974, the Minister of Natural Resources, the Honourable, Leo Bernier, appointed a 16-member public Advisory Committee to submit recommendations on the future of Rondeau Provincial Park. The Advisory Committee was charged with the responsibility of directly consulting interest groups and the general public for opinions on what the future direction of Rondeau should be.

A summary of the Advisory Committee's public involvement program is as follows:

STAGE I - 4,800 copies of a general information booklet were distributed to the public. Five public meetings were held in which 630 people were in attendance and 74 people made oral presentations. In addition, 120 written briefs were received, as well as a petition of 7,000 signatures;

STAGE II - 2,500 copies of a Draft Policy Recommendations Report were distributed, based on the Advisory Committee's deliberations. Four public meetings were held to obtain public input to the recommendations. Five hundred and thirty people were in attendance and 74 made oral presentations. One hundred and eighty-seven briefs were submitted, as well as a petition of 177 signatures.

Based on this public input, the Advisory Committee submitted its final Policy Recommendations Report to the Minister of Natural Resources in the fall of 1975. This report contained 104 recommendations. In April 1976, the Minister replied to the Committee accepting 93 recommendations. Four additional recommendations were accepted following modifications, seven recommendations were rejected and several required additional study, for example, deer management. This reply was sent to all of the groups and individuals who were on the Committee's mailing list;

STAGE III - A planning consultant, W. E. Coates and Associates of Guelph, Ontario, used the approved policy recommendations to formulate a preliminary master plan. In the summer of 1977, the Advisory Committee held three public hearings to present the plan to the public and 1,000 full copies of the plan and another 3,000 abbreviated copies were distributed. Four hundred and forty people attended these meetings with 65 oral presentations. In addition, 21 briefs were received. On September 20, 1977, the Advisory Committee submitted its recommended Rondeau Provincial Park Preliminary Master Plan to the Minister. Although the preliminary master plan was not approved, the efforts of the Advisory Committee have given guidance to the day-to-day management and operation of Rondeau Provincial Park while the ministry considered a number of the Committee's recommendations in greater detail.

The public Advisory Committee for Rondeau Park was officially disbanded in the spring of 1978.

All of the documents, briefs, transcripts and meeting minutes of the Rondeau Advisory Committee are on file in the Chatham office of the Ministry of Natural Resources and are available for public scrutiny;

STAGE IV - 1978 to 1983

The park was administered using the approved recommendations with any development or improvements reflecting the accepted development concept.

Also during this period, recommendations not accepted by the Minister were discussed, and management research was conducted to answer pending questions such as forest-deer management and Rondeau Bay management.

STAGE V - 1983 to 1985
With the Chatham District Land Use Guidelines completed and approved, the park management planning process was re-initiated utilizing the revised guidelines for management plans, management research recommendations and accepted Advisory Committee recommendations for preparation of this Rondeau Provincial Park Preliminary Management Plan;

STAGE VI - 1985 to present
The Ontario Provincial Parks Council was requested by the Minister of Natural Resources to review the issue of cottaging in Rondeau and Algonquin Provincial Parks. This revised plan reflects the results of the recommendations presented by the Council.

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APPENDIX I

AN OVERVIEW OF THE RONDEAU PROVINCIAL PARK FOREST-DEER SITUATION AND MANAGEMENT OPTIONS

1.0 INTRODUCTION:

The purpose of this appendix is to provide additional information about Rondeau's most important natural resource: the Carolinian forest including its associated flora and fauna. The main area of concern in Rondeau is not the deer per se but rather the detrimental impact that they are having on the park's unique forest communities. This problem has been addressed in the Rondeau Provincial Park Preliminary Management Plan and the proposed policies concerning its management have been presented specifically in Section 3.0.

This appendix further explains the complex inter-relationships of deer and the forest and reviews options for deer management.

2.0 THE ECOLOGY OF THE RONDEAU FOREST:

The Rondeau forest community has become well known primarily for two reasons. First, the composition of the forest is very diverse and includes many plant species which are typical of more southerly regions of eastern North America. At the same time, the forest is one of the largest remaining stands of its kind in southern Ontario and contains many imposing individual specimens. The present-day Rondeau forest is a product of regeneration and succession that followed selective logging in the latter half of the nineteenth century.

The term "Carolinian" has come to be applied to Rondeau to describe the southern character of its vegetation. This term is more popular than scientific but is used here to indicate that a relatively small but botanically significant component of the Rondeau forest is comprised of species which are characteristic of more southerly areas and which, for the most part, are uncommon or rare in Canada.

Separate studies of Rondeau have proposed various classifications of vegetation communities, both in terms of numbers and composition. These studies are somewhat difficult to integrate. However, most community classifications have recognized two major forest types: black oak-white pine dominated communities on drier sites, and a variety of hardwood communties on mesic (moderately moist) and wet sites. The latter are composed, in varying combinations, mainly of sugar and soft maple, white and red ash, red oak, American beech, tulip-tree, basswood, ironwood and yellow birch.

Twenty-two species of Carolinian trees and shrubs (after Fox and Soper 1952, 1953, 1954) occur or have occurred at Rondeau (Table 1). Together, these species represent about 20 per cent of the woody species in the forest.

It is not just the rich and exotic species composition of the Rondeau forest that has attracted attention. The abundance of large, spectacular trees, the size of the forested area, the diverse herbaceous component containing many species rare in Canada, the significant wildlife and the overall aesthetic appeal of the forest have helped establish Rondeau as one of Ontario's outstanding natural areas. Although representative in general of the extensive eastern deciduous forest, a combination of factors specific to the Rondeau peninsula and the lower Great Lakes have produced an ecosystem that is unique.

2.1 Natural Patterns of Communities and Succession:

The present-day forest is the

product of a series of natural and human-related forces (see Figure 1). The climate and soil of the Rondeau peninsula provide the physical setting in which the natural forest has developed. These factors set the overall limits on species that can naturally grow here, and dictate the resultant types of forest communities.

In Rondeau and the surrounding area, successional processes of vegetation on average sites typically lead to a climax (viz., self-perpetuating) forest of sugar maple-American beech (Braun 1950). On drier sites in Rondeau, black oak-white pine communities are better adapted, and in the wet sloughs soft maple and red ash predominate.

A wide variety of other hardwoods characteristic of the eastern deciduous forest are adapted to particular niches in these generalized communities. In addition, the moderate climate of the Lake Erie north shore is suitable for the growth of several species which normally occur farther south. These species seldom attain dominance, but give the forest a rich diversity and high human interest. Each species in the forest has its own specific preferences and tolerances to physical factors such as moisture and light intensity, as well as a particular strategy for reproduction and survival.

Normal forest succession and community development eventually results in a closed canopy whereby little sunlight can penetrate to the forest floor. Only shade-tolerant species of seedlings and saplings can grow well under a closed canopy, primarily those of sugar maple and beech, as well as blue beech, ironwood, basswood and spicebush. Most of the Carolinian species are shade-intolerant and require high light intensity in order to regenerate and grow into the canopy. Examples of these species at Rondeau include tuliptree, black walnut, several species of oaks, the hickories, sassafras and sycamore.

Naturally recurring disturbances regularly alter forest succession in localized areas of the forest. At Rondeau, large-scale blowdown, triggered by root damage to large trees during periods of high lake levels, has provided openings in the canopy under which shade-intolerant species can regenerate. Dutch elm disease and logging have also created openings necessary for regeneration and growth of early successional species. These events have largely been responsible for maintaining a species diversity in the composition of the forest.

Rondeau's oak-pine communities probably originally developed on dry, sandy or grassy sites. Subsequently, they may have been maintained by periodic fires which destroyed encroaching woody vegetation and created the open conditions which favoured their regeneration.

Processes of succession in wet sloughs have been little studied. Presumably, the soft maple-red ash communities are largely self-perpetuating.

2.2. Influences of Man:

The substantial effects that man's activities have had on today's forest may not be generally appreciated, even though Rondeau has been a provincial park since 1894 and no major logging has occurred since 1907. Around 1650 there was a significant grassland component, apparently maintained by fires set by Indians. A forest ecosystem has dominated, however, for the last two centuries.

Logging occurred in Rondeau as early as the 1790s when some prime pine and oak timber was taken

for shipbuilding purposes. Pigs and cattle were grazed in the forest around 1812 and again between 1870 and 1900. Conditions resulting from the last major logging period in the latter half of the nineteenth century produced the main components of the forest that we see today. Regeneration in what must have been quite open stands led to the development of a very diverse forest. By around 1950, surviving trees had formed an essentially closed forest of impressive proportions. In the 1960s and again in the 1970s, recurring episodes of windthrow or blowdown drastically opened up the forest. In the 1980s blowdown has continued along with increased mortality of the remaining mature trees.

For these reasons, conditions are currently ripe for a major surge of regeneration, including that of the shade-intolerant Carolinian species. This could be expected to occur were it not for a very significant partly natural, partly human factor: the presence of a large number of white-tailed deer.

3.0 THE DEER:

Deer have undoubtedly been present in Rondeau for thousands of years as suitable habitat developed following retreat of the glaciers. Thus, they are a normal factor in the forest ecosystem. Their population was historically governed by natural checks and balances of reproduction, predation, disease, weather, the supply of food and cover and hunting by native peoples.

European man soon changed the natural equations governing deer and deer habitat at Rondeau in three main ways: by largely eliminating natural predators; by hunting and by changing habitat conditions (often to the deer's benefit) through timbering, land clearing and agricultural practices in and around the park.

Between 1870 and 1900 there apparently were virtually no deer at Rondeau, probably due to intense hunting. For a brief period, the Rondeau peninsula was actually leased as a sort of hunting preserve. In 1899, five deer escaped from a small, zoo-like enclosure that had been set up for the amusement of visitors. These animals, along with the increasing deer herd in adjacent Kent County, reproduced quickly. By 1910, park staff reported deer damage to white pine seedlings and recommended control.

Since that time there has been an ever-present issue concerning management of the deer and the forest in Rondeau. This controversial issue has involved a range of public opinions, with some groups and individuals favouring deer control and others opposing it. Deer numbers have fluctuated dramatically in the face of natural causes and sporadic control programs. The deer population control program which was used between 1912 and 1973 involved Ministry staff culling the herd by shooting (Table 2). Adequate regeneration of forest species was observed when the deer density was low. Gains in regeneration following reduction of the deer herd were lost when deer control was not sustained over time. Since 1974, no deer have been removed from the park. This has contributed to an artificially high number of deer in the park, leading to an imbalance in the forest ecosystem.

In the absence of effective population control mechanisms, the number of deer has exceeded that point where the forest can renew itself.

Deer browsing occurs on different plant species depending on their relative availability and the preferences of the deer. Shade-intolerant species are hardest hit for a variety of reasons. As previously pointed out, these tend

to be the Carolinian components of the forest, and today a very small proportion of these species is made up of saplings -- the mature canopy trees of the future.

A number of studies, both past and present, have demonstrated that deer constitute the single, most significant limiting factor on seedling and sapling growth at Rondeau. Based on this research, future prospects for several tree species, such as tulip, shagbark hickory and black walnut are now in jeopardy.

4.0 DEER-FOREST PROBLEMS:

4.1 Past Research:

In the early 1900s, park superintendents, foresters and naturalists noticed changes in the Rondeau forest. They began to equate these changes with the presence of an increasingly large deer herd which, they believed, was having a detrimental impact on forest composition and regeneration. However, these conclusions were based on general observations, not scientific evidence.

In the 1950s, the Department of Lands and Forests assigned biologist Charles O. Bartlett to undertake a major investigation into the forest and deer relationships in Rondeau. After extensive research, he concluded that the deer had been the primary reason for an alteration of the forest composition and recommended a significant reduction in the herd.

Bartlett's study (published in 1958) was the most up-to-date, quantitative forest-deer information available when the Rondeau Provincial Park Advisory Committee began its deliberations about the future of the park in 1974. While the Advisory Committee recognized that deer control programs might be necessary to perpetuate the Carolinian forest community, it recommended that additional scientific study and monitoring be undertaken prior to any population control measures being implemented (see Section 6.1).

4.2 Recent Research:

The results of two recently completed studies have substantiated many of Bartlett's earlier conclusions and have further illustrated the role that deer play in limiting the regeneration of Carolinian and other species in the Rondeau forest.

Ministry of Natural Resources forester Ken Yaraskavitch (1983) compared regeneration and growth in unfenced areas with that in fenced plots (exclosures) where deer had been excluded. He focused on tulip as the most common Carolinian tree and quantitatively compared results with other hardwood species and shrubs.

Yaraskavitch noted that tulip-trees regenerated well in forest openings, as did other hardwoods, regardless of the presence of deer. However, growth from the seedling through the sapling stage into the lower canopy was severely restricted by deer. Tulip-trees showed very little growth in the unfenced plots where the presence of deer was unrestricted. These trees actually appeared to decline in average height during the last year of the five-year study. Only two tulip-tree saplings in the 0.2 hectare (½ acre) unfenced plots grew into the lower canopy (that is, over 2 metres in height), and both were made inaccessible to deer by windfalls. Good growth in the exclosures where deer were not permitted access pointed to deer as the controlling agent in the ability of the seedlings to survive and grow.

The extent of deer browsing presently occurring at Rondeau is perhaps even more forcefully demonstrated by the marked decline in

height and numbers of hard maple saplings in the control plots compared to those in the exclosure plots. Hard maple is not normally considered a preferred food by white-tailed deer. Nevertheless, between 1978 and 1982, the number of hard maple present per 0.4 hectares (1 acre) in the control plots dropped from 1,450 to 850 with none exceeding 60 cm in height.

The hard maple in the exclosures behaved in a completely opposite manner. Between 1978 and 1982, the number of hard maple in the exclosures almost tripled from 1,175 to 3,375, with some saplings advancing beyond the 1.8 metre level.

Although the results of this study demonstrate that hard maple is being severely restricted by deer, it is likely that this species will continue to be well represented in the future forest canopy because of sheer numbers and high regenerative potential. Growth of white ash saplings was less affected than most other species, but also showed signs of heavy browsing. Shrubs were less heavily browsed, especially blue beech, ironwood and spicebush.

Although other factors were also found to be influencing forest regeneration, the Yaraskavitch study, like that of Bartlett, pointed to deer as the main limiting factor. Yaraskavitch concluded that deer have had and will continue to have a major impact on forest composition and structure, both through direct effects of browsing and by favouring the development of the shrub component. Proliferation of shrubs will, in turn, select against shade-intolerant Carolinian species, among others. Yaraskavitch predicted a future forest with a much higher component of hard maple, white ash, ironwood, blue beech and spicebush and a lower overall height structure.

Using a different approach, E.G. Haggith (1982) reached essentially the same conclusions in a Master of Forestry thesis. He sampled dry and mesic sites to determine size (age) distributions of tree species and compared the species composition of the canopy with that of the understory in different forest communities. Both lines of evidence pointed to a severe lack of recruitment of several species into the canopy. He noted a general scarcity of seedlings greater than 0.3 metres in height and a complete absence of white pine, black walnut and white oak seedlings. He concluded that this situation would eventually lead to species impoverishment of the forest. He predicted the future elimination of shagbark hickory, black walnut, white pine, black cherry, white oak, red oak, black oak and sassafras from Rondeau.

With the continued heavy browsing pressure on preferred species, Haggith concluded that shade-tolerant species, which are relatively unpalatable to deer, would be favoured. He further concluded that hard maple, blue beech, white ash and ironwood would eventually dominate all dry to mesic communities. American beech, another widespread shade-tolerant hardwood at Rondeau, can also be included. According to Haggith, the relatively more palatable shade-intolerants--the Carolinian species--will disappear altogether or play an insignificant role in the future forest.

Along with Bartlett, Yaraskavitch and other observers, Haggith agreed that browsing of seedlings by white-tailed deer is regulating both the species composition and the number of stems recruited into the lower forest canopy. This single factor outweighs all other environmental influences on the forest vegetation. While all plant species are subject to this browsing pressure to some degree, the Caro-

linian species are affected to the greatest extent.

4.3 Conclusion:

A number of comprehensive, long-term scientific studies have now demonstrated that browsing by white-tailed deer is having a major influence on forest succession in Rondeau Provincial Park. The presence of uncontrolled deer browsing does not appear to be limiting tulip and other hardwood regeneration in terms of numbers of seedlings reproduced. However, the results of five years of very recent study indicate that tulip and other hardwoods are being severely restricted by deer in terms of growth, thereby effectively preventing trees of these species from reaching maturity and replacing trees which are being lost from the mature forest canopy.

The Yaraskavitch study indicates that tulip as a viable species will be eliminated from the future forest canopy by deer. Within the hardwood species group, some other species will also be eliminated; and even for those species that do grow into the forest canopy, their numbers will be fewer than were present in the past. At the same time, shrubs are increasing their dominance due to deer. The regeneration of shrubs not only seems to be encouraged by current deer population levels, but it also appears that shrub height development is not being significantly affected. Thus, as the current forest overstory collapses through natural processes, there is strong evidence that tree replacement has been and will continue to be profoundly affected by deer through the alteration both of species composition and reduction of the numbers of trees that will occupy the forest canopy.

On the basis of the Yaraskavitch study, the probable result is that a tall, species-diverse forest canopy will be replaced by a canopy with a lower height structure which contains fewer species, fewer trees and a greater shrub component. Shrubs and trees which will predominate in the future will be those that are not only more shade-tolerant but which are also more browse-resistant, either by being less palatable to deer or by being more prolific reproducers. Yaraskavitch's prognosis is that hard maple, white ash, ironwood, blue beech and spicebush will dominate the future forest canopy in Rondeau and select against the Carolinian species.

It is true that the forest in Rondeau is affected by a large number of variables including soil type, water table, climate, weather, present stand conditions, insects, disease, management techniques and other factors. However, while deer are just one of the many variables influencing forest succession, the Yaraskavitch study visually demonstrates--through the use of unfenced and fenced plots in which the only difference between the plots is the presence or absence of deer--that no matter how all of the various factors combine and interact to affect the forest, it is the presence of deer that regulates and controls forest growth and development once regeneration has taken place.

More than trees and tree communities are being negatively impacted by deer overbrowsing. Herbaceous vegetation (for example, the white trillium) has also been severely impacted by browsing and trampling due to an overpopulation of deer. The nodding pogonia is found in only two sites in Canada of which Rondeau is the main site at present. Deer select flowers as food due to their high energy value and low fibre content. Spring flowers in particular have been severely impacted in Rondeau. The only normal display of spring wildflowers is now limited to the

two small deer exclosures.

Shifts in the species composition of the ground cover to more grasses, raspberries and barberry have also been noted. These ground cover shifts can negatively limit future regeneration of Carolinian species and associated flora as well as affect the fauna that depends upon it for survival such as ground nesting birds and some small mammals.

5.0 DEER MANAGEMENT OPTIONS:

The previous section clearly establishes that browsing by white-tailed deer is presently the single, most important factor in influencing forest vegetation, altering species composition and reducing the number of trees that will eventually occupy the forest canopy in Rondeau Provincial Park. It also describes the negative impact that deer are having on the herbaceous cover on the forest floor.

A management strategy is required to achieve a balance between the number of deer in the park and the quality of the forest to be protected. The goal must be to achieve a population level of deer that once again permits the renewal of the Carolinian forest ecosystem. The optimum deer population level is 100-125 (see 6.1). This strategy is identified in Section 3.3.3 of the Preliminary Management Plan. It was earlier supported by policy recommendations 26 and 33 of the Rondeau Provincial Park Advisory Committee.

Some form of deer population control must be re-established in order to perpetuate Rondeau's Carolinian forest ecosystem. This control must be consistent year after year as deer can rapidly increase in numbers if control measures lapse.

The following twelve management options have been considered as a means of reducing and controlling the white-tailed deer population in Rondeau Provincial Park:

- Do Nothing;
- Scientific Collection of Deer;
- Introduction of Natural Predators;
- Sterilization and Birth Control Measures;
- Increased Hunting Pressure Outside the Park;
- Forest Management Options;
- Deer Feeding Programs;
- Capture and Relocation;
- Fencing;
- Controlled Public Hunt;
- Population Reduction by Ministry of Natural Resources' Cull;
- Ministry Cull Involving Public Participation.

A description of each option and a review of considerations pertaining to each follows.

5.1 Do Nothing:

This, in effect, is what has been done in Rondeau since 1974. The Do Nothing approach simply allows the deer herd to fluctuate in numbers without any interference by man. For example, annual deer counts since 1977 indicated a gradual increase in numbers to 486 deer in 1982, then a fluctuating decrease to a low of 332 in 1987, and finally another increase to 489 in 1989. No recovery of the vegetation occurred during this period.

5.1.1 Considerations

- If the Do Nothing option is selected, it would not be possible to protect the Carolinian forest and associated flora and fauna including rare, threatened or endangered species. This would necessitate a reclassification of the park from Natural Environment to Recreation, a modification of park zones as well as a change in park goals and objectives. The park management plan would have to be completely rewritten;

- The Do Nothing management technique would maintain the status quo and the deer population would continue to be self-regulating based on the available food supply and other controlling factors such as winter conditions;

- People who oppose the killing of wildlife and those who advocate a strict non-intervention philosophy to environmental issues would support this option;

- The Do Nothing technique will contribute to species impoverishment in Rondeau. It will eventually lead to a proliferation of shrubs which in turn will select against shade-intolerant Carolinian species among others;

- Under continued heavy browsing pressure, the shade-tolerant species which are relatively unpalatable to deer will be favoured and a forest with a much higher component of hard maple, white ash, blue beech, ironwood and spicebush and a lower overall height structure will eventually evolve. Meanwhile in the openings which would form from time to time, sun-loving field grasses and other herbaceous vegetation will become established and will further inhibit forest regeneration;

- The diverse variety of floral and faunal species characteristic of the Carolinian community and unique in Rondeau would continue to disappear until certain species became extirpated or very rare.

5.2 Scientific Collection of Deer:

This management technique would involve the taking of deer--either live or dead depending upon the nature of the study--for scientific purposes. Used as a means of population control, scientific collections would normally result in the relocation or destruction of the animals following completion of the study.

5.2.1 Considerations

- Scientific collection used as a means of population control would not be particularly effective over the long term and would not achieve the desired population reduction;

- Most scientific studies involving the killing of deer for the collection of data could not be justified in perpetuity, and this is what would be required to solve the problem;

- The Ministry of Natural Resources has no planned need for research which would require this number of deer.

5.3 Introduction of Natural Predators:

This technique would involve the introduction of natural predators into Rondeau Park to control and possibly decrease deer population numbers. Natural deer predators include coyotes, timber wolves, black bears and eastern cougars.

Bobcats might also be introduced, as they were once present in Ontario. Although they would contribute to the natural control of the deer, they would not have much more impact than the existing coyote population. Their impact on other species would also have to be assessed.

5.3.1 Considerations

- The park already contains a small stable population of coyotes which are not having a major impact on the deer herd;

- Introduced natural predators in conjunction with the existing coyote population would not reduce the deer numbers sufficiently to allow the Carolinian forest to recover;

- It is very doubtful that natural

predators could be maintained in the park to the extent that they would have any significant or lasting impact on the deer population. There is also a concern that natural predators would not remain within the park and would eventually wander into adjacent farming areas;

- Park users, local residents and cottagers within the park would probably have some strong objections about the release of predators such as timber wolves and black bears into a near-urban provincial park;

- Natural predators to the deer would also have some impact on local pets and livestock as well as other non-targeted wildlife species within the park.

5.4 Sterilization and Birth Control Measures:

These techniques involve the sterilization of deer or the introduction of an oral birth control formula. Sterilization would include neutering of the bucks or chemical implants in the does to reduce fertility. The second alternative would involve setting out grain or feed which had been chemically treated to provide an oral birth control formula for the does.

5.4.1 Considerations

- Rather than destroying the deer, this option would limit the ability of the herd to reproduce;

- If a sufficient number of deer in the park could be sterilized or treated with an oral birth control formula, the processes of natural mortality would eventually result in an overall reduction of herd numbers--that is, when the mortality rate exceeded the birth rate of new fawns, total herd numbers would decline;

- Sterilization of the bucks would require that the animals be caught and neutered. This presents numerous technical, treatment and recovery problems;

- The technologies concerning chemical implants and oral birth control for deer are currently in the research stage. These technologies have not yet been field tested in a wild deer population nor is it known if results would be effective when applied to large populations. Chemical implants pose capture, treatment and recovery concerns for the does on an annual basis as the implants usually do not last longer than one year. In addition, the introduction of an oral birth control formula which could be delivered in feed set out for deer is non-selective and unreliable. Other non-targeted animals could eat the feed and be affected;

- Given the large number of deer that currently live in the park, it is doubtful that any of these birth control techniques could be carried out on a scale which would have a significant impact on the population;

- This option would only prevent the treated animals from reproducing. It would not prevent the existing population from continuing to consume the park vegetation.

5.5 Increased Hunting Pressure Outside the Park:

Recent telemetry studies which involved the placing of radio collars on a number of deer in the park have shown that the deer in Rondeau are basically a resident population which remain in the park all year. Because of this, increased hunting pressure outside the park would have no effect on the existing deer population within the park.

5.6 Forest Management Options:

Forest management options could include planting programs to encourage the re-establishment of Carolinian communities native to the park and the spraying of animal repellants on existing Carolinian vegetation in an attempt to discourage browsing by deer.

5.6.1 Considerations

- The above-noted options attempt to protect or encourage re-establishment of existing Carolinian vegetation without directly controlling or reducing the deer population;

- Over the short term, the use of intensive forest management and planting techniques could result in improved Carolinian growth, but that would be very unlikely with the present high deer population. Regardless, over the long term the deer population would increase to the point where the vegetation would eventually suffer again due to increased deer numbers;

- It is generally believed that forest management options on their own would not be successful without an appropriate reduction in the size of the deer herd;

- Additional planting of Carolinian species would simply provide a greater abundance of browse for the deer and a corresponding increase in population could occur;

- The use of animal repellants would be ineffective on a scale large enough to cover the entire park. The large-scale use of chemical repellants might be ecologically damaging.

5.7 Deer Feeding Programs:

Deer feeding programs would involve the use of man-made feed and grains to supplement the normal diet of natural vegetation. A feeding program could also include the planting of fast growing browse species for deer. Normal deer feeding programs, where they do exist, are carried out in January and February to assist the deer through the winter months when natural food sources are least abundant.

In the case of Rondeau, if supplemental feeding were introduced to prevent the deer from consuming the natural vegetation, it might have to be implemented on a year-round basis, since some scientific evidence suggests that Carolinian vegetation may suffer most during the spring and summer growing season.

5.7.1 Considerations

- Over the long term, supplemental feeding could eventually result in an increased number of deer, which in turn would require additional feeding efforts and could eventually lead to increased pressure on the Carolinian forest ecosystem;

- Once introduced, such a program would be very difficult to reduce or eliminate as deer numbers would continue to increase;

- The cost of food and manpower necessary to distribute the food would become greater as the demand increased;

- Deer feeding programs are used in order to feed hungry deer. There is no evidence to suggest that such an artificial feeding program would be successful in reducing browsing pressure on vegetation to the point where the Carolinian forest ecosystem could be sustained.

5.8 Capture and Relocation:

This option involves capturing deer alive by darting (with a dart gun), by using box traps, or by driving the animals into a corral. With each of these techniques, injuries

and mortalities can often occur because of human error, the poor condition of an animal or accidents. Once captured, deer would be placed into a crate and immediately trucked to one of a number of release sites. Factors to consider before relocating animals are common to each of the three capture methods.

5.8.1 Darting Considerations:

- With this method, an individual or group of people equipped with dart gun(s) would seek animals to drug and capture them. In experienced hands and under specific conditions, dart guns are effective and have been widely used across North America. Suitable drugs are available;

- Dart guns must be operated at close range and require an unobstructed shot since the dart is easily deflected by brush or twigs. The dart must be properly placed in a large muscle mass and the animal must be observed until the drug takes effect. Being relatively tame, a few deer located on or adjacent to roadways could be immobilized. Rondeau's existing vegetation would make it difficult to dart the majority of deer;

- Darting was attempted in Rondeau in 1973 and 1974 by the Ontario Humane Society and the University of Guelph with the assistance of local sportsmen. With a target of 150 deer, it took 650 man hours to dart 20 deer. Only 10 of these were ever located after the drug took effect and three deer died. Seven deer were eventually relocated;

- Difficulties with this technique also include a lack of the experienced personnel needed to successfully drug and handle the animals humanely. Although there is often public support for live capture, many people do not take into consideration the skill necessary to minimize injuries to these large, wild animals;

- For darting, as with all capture methods, the success rate declines as deer densities fall and the remaining animals become more wary. Lower success rates as deer numbers fall cannot be compensated by involving large numbers of people as the deer must be calm in order for the drugs to be effective. Darting is not considered a feasible option as it is unlikely that the required number of deer could be caught.

5.8.2 Box Trapping Considerations

- This technique involves baiting deer into large box-shaped traps that have doors on two sides. The time required to catch deer using this gear is extremely variable. In the Ontario Cooperative Deer Study, an experienced three-man crew required five nights to capture one deer at concentrations found in winter deer yards. These times do not include the time required for construction, placement and maintenance of the traps;

- Trapping should not begin until the bucks begin to lose their antlers and should terminate when antlers begin to regrow. Otherwise severe injuries can result. In Rondeau, use of this technique is only feasible for about three months of the year (January - March);

- Trapping success is subject to weather conditions, food availability (since deer must be baited into traps) and other factors. As with darting, the success rate declines as deer numbers fall. Trapping would require a massive amount of funding and manpower with little guarantee that a large enough number of deer could be removed in the short period available.

5.8.3 Corralling Considerations

- In this option, a large corral would be constructed and deer driven into it. Crates could be added to the perimeter or the animals could be darted;

- Experienced biologists strongly advise against this method. Deer panic when confined and can cause serious injury to themselves and personnel involved in the operation. Driving only a few deer at a time in order to minimize their stress, would mean that a great number of drives (with associated costs) would be required. Success rates would decline as deer densities declined and there would be little chance that sufficient deer could be captured in this manner particularly after a series of drives had harassed them;

- Drugs do not function well on excited animals. It would also be very difficult within a corral to identify a specific drugged animal and prevent multiple dosages. Constructing a large corral would mean further damage to the forest ecosystem.

5.8.4 Relocation Considerations

- Captured deer would be crated and immediately moved to a number of release sites;

- Moving live, large, wild animals such as deer is stressful to them and often leads to injuries or death ranging from 4 to 26 per cent of the animals transported;

- White-tailed deer which are relocated suffer significantly higher mortality rates than resident populations;

- A number of deer studies from other jurisdictions suggest that deer should be moved at least 40 km (25 miles) or they will return to their home site. Deer should be released into suitable habitat which is not at its own carrying capacity. The Ministry of Natural Resources has not identified potential release sites and thus has no specific information on impacts to habitats or local deer population levels, if this large number of deer were to be relocated. In general, deer populations in southern Ontario have grown since the early 1980s to the point where crop damage and deer/vehicle collisions must be considered. Also of concern is the fact that although the results are inconclusive, deer at Rondeau have recently tested positive for Lyme Disease, a bacterial disease to which people are susceptible. It would not be prudent to move any deer from Rondeau without conclusive proof as to what impact that action might have on the spread of Lyme Disease.

All of the above considerations suggest that a live capture and release program, given the large number of deer that must be removed quickly, would not be feasible, successful or appropriate.

5.9 Fencing:

This option involves fencing off the north boundary of the park, creating small temporary fenced areas or establishing large permanent fenced areas. The idea is to drive out and keep out deer from within those fenced areas in order to allow the vegetation to renew and perpetuate itself in the absence of deer browsing.

5.9.1 Fence Off North Boundary Considerations

- This option would involve the erection and maintenance of a permanent deer-proof fence running along the north boundary of the park from Lake Erie to Rondeau Bay. It would also require a deer-proof gate or entrance to

the park to allow movement of public vehicles and pedestrian traffic;

- A massive deer drive would be required to drive the deer out of the park. These deer drives would be required periodically as it would be impossible to drive out deer without missing some and to prevent deer from returning to the park. For example, the fence would be subject to vandalism and deer could enter the park by swimming or by walking on ice in the winter;

- Driving the deer out of Rondeau would create many problems outside the park. Deer habitat is scarce outside the park; hence, those areas would likely come under extreme pressure by the displaced deer. Increased damage to crops and other property would occur. The likelihood of deer/vehicle accidents would be very high.

5.9.2 Small Temporary Fenced Area Considerations

- This option would involve establishing numerous, small fenced-off areas that would be left in place only long enough to allow tree regeneration to occur and become established. The fencing would then be moved to protect new areas. Large numbers of small fenced-off areas would be required because the forested area itself is large at approximately 11 square kilometres;

- This option would protect the trees only and not the entire forest ecosystem. The herbaceous ground cover on the forest floor, for example, would not be protected once the temporary fence was removed from any particular area. As a result, the goal and objectives for the natural life features of this Natural Environment class provincial park would not be achieved with this option.

5.9.3 Large Permanent Fenced Area Considerations

- This option would involve the establishment and maintenance of a large permanent fence erected largely along the existing road network. It would enclose that portion of the forest bounded by Bennett Avenue in the north and the Pointe aux Pins Development Zone (D3) in the south, Harrison Trail in the east and Rondeau Park Road and South Point Trail in the west. Deer would be driven out of this area although some would be missed;

- Only approximately 50 per cent of the Carolinian forest ecosystem in Rondeau would be protected with this option;

- The large number of displaced deer would compound problems elsewhere both inside and outside the park;

- The integrity of the fence could not be maintained due to vandalism and tree fall. Trees within 30 metres of either side of the fence would have the potential of falling on and causing breaks in the fence. The fence would require daily inspections, constant maintenance and total replacement approximately every ten years. The cost would be further increased by the need to periodically drive deer from the fenced area;

- Fencing large areas would reduce the aesthetic appeal of the park and restrict public access to that portion of the park. It would also reduce the available food supply for the deer, putting additional pressure on the herd and on those areas of the park not fenced.

5.10 Controlled Public Hunt:

This option would involve the crea-

tion of an open season for deer for a specified time period in Rondeau, similar to other public hunts that presently occur in wildlife management units outside the park. Special regulations would be put into place to control the number and sex of deer harvested through the issuance of antler/antlerless tags by means of a lottery system. The park would be divided into hunting and non-hunting areas and the number of hunters would be limited for safety reasons.

5.10.1 Considerations

- The number of hunters, timing of the hunt, composition of the harvest, season length and access to the park by hunters could be carefully controlled;

- Those favouring the creation of additional hunting opportunities would be supportive of this option;

- Those opposed to hunting and particularly to hunting in a provincial park would object to this option;

- The deer population would be reduced while recreational hunting opportunities were provided. However, it is probable that unless special hunting techniques and/or very long seasons were used, the necessary population reduction would not be achieved with this method;

- Deer carcasses would be retained by hunters, thereby eliminating any carcass disposal concerns;

- No special training of the hunters would be required other than an explanation as to the specific rules and regulations to be followed;

- Park zoning would require changes to permit hunting and to have hunting conform with provincial park policy;

- There is a public perception that Rondeau deer are "tame". Hence, the shooting of "tame" deer by hunters would not be considered a sportsman-like activity;

- This option would require a longer period of time than the two cull options, assuming there were restrictions on the number of deer each hunter could shoot. This option would, therefore, have more of an impact on other park users;

- The ministry's purpose in controlling the deer population in Rondeau is to provide for the proper management and recovery of the park's unique Carolinian life features. Over time, a controlled public hunt could result in pressure on the ministry to manage the deer herd in order to provide for and perhaps increase ongoing hunting opportunities.

5.11 Population Reduction by Ministry of Natural Resources' Cull:

This option would involve the use of Ministry of Natural Resources' staff to shoot a specified number of deer. The results would be monitored and the deer population maintained at a suitable size that would permit the renewal of the desired Carolinian forest ecosystem but still provide for some public viewing opportunities of deer.

5.11.1 Considerations

- The number of staff involved, timing of the cull, safety, etc., could be carefully controlled;

- The cull could also be highly selective in terms of size and sex of animals taken;

- This method is fast, effective and has been historically used in

Rondeau between 1912 and 1973. This method would most likely be able to achieve and maintain the necessary deer population level on an annual basis;

- Carried out over a short period of time using sufficient staff to effectively implement the strategy, this technique would result in minimal disruption to normal park activities, especially if carried out during the winter months;

- Persons opposed to the killing of wildlife for any reason would likely not accept this method of herd reduction;

- Individual hunters and organizations could be concerned with a proposal that would permit Ministry of Natural Resources' staff to shoot deer but would restrict hunters from participating in the harvest of animals through a public hunt;

- The deer carcasses could be used for food and research;

- Disposal of the deer carcasses would be a challenge. Disposal methods must meet current health regulations as the carcasses are intended for human consumption;

- Time constraints would also apply to this technique, as certain public uses would have to be restricted in the park during the time of the cull.

5.12 Ministry Cull Involving Public Participation:

This option would essentially be the same as the ministry cull option described in 5.11. The main difference with this option is that specially trained, selected and skilled marksmen, as well as ministry staff, would actually shoot the deer.

5.12.1 Considerations

- This option would allow for some public participation in the management of the deer herd;

- The cull would be carefully controlled not only regarding the selection of the marksmen but also with respect to the number, training and placement of the marksmen, timing of the operation and other organizational requirements;

- This type of cull would also be as selective in terms of the size, sex and numbers of deer harvested as with the ministry cull option described in 5.11;

- Hunters might object to this option on the basis that deer population control should be achieved by means of a public hunt;

- The segment of the public that believes that wildlife management, if necessary in a provincial park, should be undertaken exclusively by ministry staff might object to this option;

- More training, management, control and supervision would likely be needed than if ministry staff alone were to conduct the cull. The selection of the public marksmen could also be a challenge;

- Deer carcasses could be used for food and research;

- The same carcass disposal method would be used as with the ministry cull;

- Time constraints would also apply to this technique, as certain public uses would have to be restricted in the park during the time of the cull.

6.0 RECOMMENDATIONS:

6.1 Deer Population Control:

As previously discussed, protection

and perpetuation of the Carolinian forest ecosystem is regarded as the most important resource management goal for the park. Consequently, the damaging effects of uncontrolled deer browsing on forest succession must be reduced as a first step toward achieving this goal.

Throughout the entire forest, the most practical means of controlling the level of deer browsing is to control the deer population itself. The deer population must be controlled at the number which the perpetuation of the Rondeau forest ecosystem can support. This must be accomplished without causing an unacceptable disruption to forest succession and yet at the same time ensuring that there remains a large enough deer population to provide park users with viewing opportunities.

In his comprehensive 1958 report, A Study of Some Deer and Forest Relationships in Rondeau Provincial Park, Charles O. Bartlett recommended that the deer population be maintained at 100 to sustain the park's forest community. The current population, which is seriously disrupting forest succession in Rondeau, is in the order of 489 overwintering deer--nearly five times higher than Bartlett's recommended figure. Most recently, in 1989, in a paper entitled Population Dynamics of Rondeau Deer, D. R. Voigt and J.D. Broadfood, using a completely different method, concluded that a deer population level of "120-125 animals should allow ample forest regeneration" in Rondeau. The entire text of this paper is found in Appendix II.

Based upon the above it is recommended in the accompanying Preliminary Management Plan that the deer population be controlled and that the population be reduced to approximately 100-125 animals. The herd must be annually maintained at this level in order to prevent a recurrence of the present situation of severe overpopulation.

Twelve deer management options have been presented in Section 5.0. Some of these options are not considered feasible or practical given the necessity of reducing and maintaining the deer population at 100-125 animals.

Certainly the Do Nothing option is not feasible given the previously stated objective. This option would not reduce the deer population and, under continued heavy browsing pressure, the Carolinian forest ecosystem would continue to decline.

A number of additional management options (viz., Scientific Collection of Deer, Introduction of Natural Predators, Sterilization and Birth Control Measures, Increased Hunting Pressure Outside the Park, Forest Management Options and Deer Feeding Programs) could all have some minimal impact on the deer population. However, these options are not considered feasible or practical for the reasons previously discussed.

None of these options would result in a significant reduction of deer numbers nor would they be effective in maintaining the deer population at the necessary level. There would be little opportunity for the Carolinian forest ecosystem to reestablish itself.

The five remaining options (viz., Capture and Relocation, Fencing, Controlled Public Hunt, Population Reduction by Ministry of Natural Resources' Cull, Ministry Cull Involving Public Participation) all appear at first glance to have some ability to successfully reduce and control the deer population over a period of time. This in turn would allow for the protection and perpetuation of the Carolinian forest ecosystem.

The Capture and Relocation option initially appears to provide some positive opportunities. With this option, deer would be captured by darting, live trapping or corralling and then relocated outside the park to a suitable receiving area.

Further investigation of this option suggests that it is most unlikely that these techniques would result in the capture of a sufficient number of deer (385 initially, 50-60 annually thereafter) to achieve the desired results. There are also serious concerns about moving deer that may be infected with transferable diseases (such as Lyme Disease) and disrupting resident deer populations in the receiving area(s).

Studies have shown that capturing and moving deer is stressful to the animals and often results in death or injuries affecting from 4 to 26 per cent of the animals transported. Survival rates for relocated deer are frequently low. Delayed mortality has resulted in losses of 55 to 85 per cent following relocation.

In conclusion, capture and relocation options carried out on a large scale have proven to be impractical, time consuming and ineffective for catching and moving a large number of deer quickly and humanely.

The fencing option would initially appear to have some advantages. With this option, deer would not be shot or captured and relocated. Rather, the whole park, a single area, or a number of areas within the park would be fenced to exclude the deer and allow the Carolinian forest ecosystem to recover.

The first fencing option considered was to fence off the north boundary and to conduct a massive deer drive in order to remove as many deer from the park as possible. This would result in a large number of deer outside the park with nowhere to go. This would simply displace the problem and further exacerbate the situation outside the park. Some deer would eventually get back into the park by walking on ice or swimming around the fence, and annual or periodic deer drives would probably be required to remove as many deer as possible from the park.

The second fencing option presented involved the construction of a large number of small fenced-off areas. The fences would be left in place long enough to allow tree regeneration to become established, then moved to another area within the park. This approach protects only the trees, not the forest ecosystem. Once the fences were removed, the herbaceous ground cover would be destroyed by the deer. This would not achieve the goal and objectives of this Natural Environment Park.

The third fencing option consisted of a high permanent wire fence being constructed along the existing road network within the park. The deer could then be driven out of the fenced area. This would protect about 50 per cent of the Carolinian forest depending on the size of the area fenced. The displaced deer outside the fence would create additional pressure and problems both inside and outside the park. The general public using the park would also be restricted by the fences. It would be difficult if not impossible to maintain the integrity of a large fenced area. Daily maintenance would be required to repair holes, remove tree windfalls, etc. Periodic deer drives would be required to remove deer from the fenced area.

In conclusion, the fencing options do not provide a permanent, viable solution to the problem. They would simply move the problem from one location to another and place additional stress on the deer population and available habitat elsewhere.

The remaining three deer management options (viz., Controlled Public Hunt, Population Reduction by Ministry of Natural Resources' Cull and Ministry Cull Involving Public Participation) all involve the shooting of deer as a method of controlling the population in order to allow the Carolinian forest ecosystem opportunity to renew and sustain itself.

There are advantages and disadvantages with each of these options as previously discussed. The Controlled Public Hunt would create additional hunting opportunities in southwestern Ontario and provide a means for the removal of deer carcasses, since hunters would remove the deer they shot. On the other hand, members of the public and some special interest groups would object to the hunting of deer in a provincial park.

One major disadvantage is that a public hunt in the Nature Reserve Zone of a Natural Environment class provincial park is prohibited by currrent park policy. Another great disadvantage with the controlled public hunt concept is that it might not achieve the necessary population reduction using accepted conventional hunting techniques. As hunters would be limited to one or two animals each, the hunt would have to extend over a lengthy period of time and still might not be successful. Other park uses would be disrupted during that period. Hence, the controlled public hunt option is not recommended as a viable solution.

Population Reduction by Ministry of Natural Resources' Cull would be fast, effective and efficient. This is a proven method of population reduction which had been historically used in Rondeau Park up to 1973. This method could achieve and maintain the necessary population level of 100-125 deer. It also complies with current provincial park policy and is in concert with the recommendations put forth by the Rondeau Advisory Committee.

Although this option presents a carcass disposal challenge, the meat would nonetheless be destined for human consumption through non-profit, charitable organizations and in accordance with health regulations. Some hunters would likely object to the fact that they would not be able to participate in the harvesting program.

The Ministry Cull with Public Participation option would involve the public by having them assist in shooting deer, carcass retrieval and field dressing. This option could be as effective in controlling the deer population as Population Reduction by Ministry of Natural Resources' Cull, since it is essentially the same except that some ministry staff would be displaced by public volunteers. The same method of shooting the deer would be used and the carcasses would be disposed of in exactly the same manner as if the cull were carried out by ministry staff only. No one would be allowed to keep the deer he or she shot. This option is distinct from a controlled public hunt and it also complies with current provincial park policy.

People who believe that the deer cull should be solely a Ministry of Natural Resources responsibility could object to the fact that members of the public would be involved in the shooting of deer in a provincial park. Some hunters, meanwhile, could object on the basis that a controlled public hunt, which would involve considerably more members of the public, should be used instead.

The Population Reduction by Ministry of Natural Resources' Cull option and its variant, the Ministry Cull Involving Public Participation, are both considered to be viable op-

tions. Of all of the options presented, both of these have the best chance of being successful and both conform to current provincial park policy. The accompanying Preliminary Management Plan recommends that one of these two options be selected as the mechanism to be used to control the deer population in Rondeau Provincial Park.

Vegetation growth will continue to be monitored in response to the new level of deer population. Should it be demonstrated that the Carolinian and other vegetative species continue to be suppressed, further reduction in the number of deer may be undertaken.

These recommendations are in compliance with the recommendations put forward by the Rondeau Provincial Park Advisory Committee in 1975. In its final Policy Recommendations Report to the Minister, the Committee proposed the following strategies after three years of public discussion:

"Recommendation 33. *Maintenance of Plant Communities*

The maintenance of plant communities, notably those of Carolinian character, should be a prime management objective. Therefore, the Committee recommends that the existing vegetation should be monitored and if a reduction of Carolinian and other preferred species occurs, management techniques should be developed to maintain these plants."

With respect to deer management the Committee further recommended that:

"Recommendation 26.

a. Deer be recognized as a significant and interesting element of the park environment in their own right;

b. Deer control programmes not be re-introduced for a three-year experimental period. Careful monitoring of deer population and behaviour, and of their effects on Carolinian and other vegetation should be carried out with the intent of reviewing the experimental programme at the end of the three-year period;

c. If deer population control programmes are necessary, they should be carried out by the Ministry."

A reduction in the deer population to allow natural forest succession while at the same time ensuring that a significant deer herd remains, would appear to satisfy the Advisory Committee's Policy Recommendation 26a.

As requested by Policy Recommendation 26b, deer control programs were not introduced for a five-year period while the effects of deer browsing on forest succession in the park were carefully studied. The Yaraskavitch report, completed in 1983, clearly demonstrated that deer have influenced forest succession in Rondeau Provincial Park for many years. At this present, very crucial time when the old growth forest canopy is collapsing, deer are having a profound effect on the renewal of the Carolinian forest in Rondeau. Without imminent corrective action, tulip as a viable species will be eliminated by deer from the park. The stocking level and the number of other hardwood species in the future canopy will also be reduced. Coincidentally, the shrub component will increase in dominance under uncontrolled deer browse pressure.

The recommendation for a cull involving only Ministry of Natural Resources' staff would clearly satisfy Policy Recommendation 26c, which stipulates that if population control programs are necessary they should be carried out by the Ministry of Natural Resources. The participation of some members of

the public in the ministry cull under the close supervision of staff also closely approximates the intent of Policy Recommendation 26c.

6.2 Deer and Vegetation Monitoring:

In conjunction with population control, a comprehensive monitoring plan to assess all aspects of the deer control program should be prepared and implemented. In particular, the response of vegetation to reduced deer numbers and biological changes in the deer population resulting from control efforts should be recorded. Data collected would, in turn, allow for the further "fine-tuning" of the management strategy.

Regeneration of both relatively uncommon shade-intolerant and more common shade-tolerant species should be observed. Of the latter, blue beech may be a principal impediment to regeneration of shade-intolerant species. The dynamics of this species and its effect on others should be studied.

6.3 Silvicultural Management:

Given a substantially reduced deer population, the current open forest, with its relatively sparse sapling component, should be pre-disposed to the regeneration of diverse hardwood species. Consequently, it is probably unnecessary at this time to employ silvicultural management to foster diversity. However, it is possible that present high levels of browse-resistant, shade-tolerant species (such as blue beech and ironwood) could seriously impair regeneration of shade-intolerant Carolinian species in the immediate future. Therefore, the option to make use of silvicultural management should be retained.

FIGURE 1:

SOME FACTORS THAT HAVE SHAPED THE PRESENT RONDEAU FOREST

HUMAN FACTORS			NATURAL FACTORS
Former Logging	----	----	Climate and Soil
Former Grazing	----	----	Aboriginal Man
Former Clearing	----	----	Forest Succession
Fire Suppression	----	----	Fire
Park-related Activities	----	----	Lake Water Levels
Deer "Control"	----	----	Fauna - especially Deer
Introduced Insects and Diseases	----	----	Insects and Diseases

PRESENT FOREST

TABLE 1: CAROLINIAN TREES AND SHRUBS OF ONTARIO AND THEIR OCCURRENCE AT RONDEAU PROVINCIAL PARK (ADAPTED FROM FOX AND SOPER, 1954)

a) SPECIES CONFINED IN CANADA TO SOUTHWESTERN ONTARIO

COMMON NAME	SCIENTIFIC NAME	OCCURRENCE AT RONDEAU
Cucumber	*Magnolia acuminata*	no
Tulip-tree	*Liriodendron tulipifera*	yes
Pawpaw	*Asimina triloba*	no
Sassafras	*Sassafras albidum*	yes
Hop Tree	*Ptelea trifoliata*	rare
Flowering Dogwood	*Cornus florida*	probably extirpated
Black Walnut	*Juglans nigra*	yes
Chestnut	*Castanea dentata*	no
Dwarf Hackberry	*Celtis tenuifolia*	no
Red Mulberry	*Morus rubra*	rare
American Crabapple	*Pyrus coronaria*	rare
Redbud	*Cercis canadensis*	no
Honey Locust	*Gleditsia triacanthos*	no
Kentucky Coffee Tree	*Gymnocladus dioica*	no
Burningbush	*Euonymus atopurpureus*	no
Black Gum	*Nyssa sylvatica*	no
Blue Ash	*Fraxinus quadrangulata*	no
Big Shellbark Hickory	*Carya laciniosa*	no
Pignut Hickory	*C. glabra*	no
Cherry Birch	*Betula lenta*	no
Swamp White Oak	*Quercus bicolor*	yes
Dwarf Chinquapin Oak	*Q. prinoides*	no
Pin Oak	*Q. palustris*	no
Shumard's Red Oak	*Q. shumardii*	no

TABLE 1: (cont'd)

b) CAROLINIAN SPECIES WITH DISJUNCT OCCURRENCES IN GEORGIAN BAY, ST. LAWRENCE OR OTTAWA RIVER AREAS

COMMON NAME	SCIENTIFIC NAME	OCCURRENCE AT RONDEAU
Spicebush	Lindera benzoin	yes
Sycamore	Plantanus occidentalis	yes
Prickly Ash	Xanthoxylum americanum	no
Bladdernut	Staphylea trifolia	rare
Cottonwood	Populus deltoides	yes
Witch Hazel	Hamamelis virginiana	rare
Bitternut Hickory	Carya cordiformis	yes
Shagbark Hickory	C. ovata	yes
White Oak	Quercus alba	yes
Chinquapin Oak	Q. muehlenbergii	yes
Black Oak	Q. velutina	yes

c) PRIMARY CAROLINIAN SPECIES, BUT FOUND AS FAR NORTH AS 40°N

COMMON NAME	SCIENTIFIC NAME	OCCURRENCE AT RONDEAU
Red Cedar	Juniperus virginiana	yes
Butternut	Juglans cinerea	yes
Black Cherry	Prunus serotina	yes
Buttonbush	Cephalanthus occidentalis	yes

TABLE 2: A BRIEF CHRONOLOGICAL HISTORY OF WHITE-TAILED DEER IN RONDEAU PROVINCIAL PARK

DATE	NO. DEER SHOT	COMMENTS
1881-1898		Last record of a deer shot in the area was in 1881. No record of deer observed in the park from 1881-1898.
1899		Five deer introduced to the park by Superintendent Gardiner.
1905		Deer numbers had increased from 5 to 65-70 animals.
1910		Deer herd estimated at 150.
1911		Deer herd estimated at over 200 animals. First evidence of deer damage to hardwoods and pine.
1912	90	Two expert deer hunters hired by the Department to reduce deer numbers. Shot 90 animals and sold venison for $80.00 Deer population estimated at 200-500 animals.
1915	63	Mostly bucks shot.
1916	105	Mostly bucks shot.
1917	200	Mostly bucks shot; 183 deer sold for $160.00
1918	57 (est.)	The population in the park was large, perhaps as many as 500 deer. Forest conditions in Rondeau encouraged deer population growth. The "bucks-only" harvest strategy stimulated reproduction, off-setting hunting losses.
1920		Deer damage to trees still a problem and population was estimated at 400.
1921	204	Department hunt; it was noted that deer were destroying all the young growth of trees.
1922	150 (approx.)	Sold venison for $160.00; public strongly supported the deer thinning program.

TABLE 2: (cont'd)

DATE	NO. DEER SHOT	COMMENTS
1923	81	Regeneration of vegetation starting to improve.
1924	71	Department "hunt".
1925		Deer population in the park estimated at 200.
1926	3	Deer population increasing.
1927	10	Deer population noted as very large.
1928		Study carried out by Superintendent R.S. Carman concluded that deer were damaging the forest.
1930		Deer population estimated at 300.
1931	185	
1933		200 deer were driven into a 50 hectare enclosure.
1934		20,000 trees blown down; major windthrow salvage operation.
1935	99	Population estimated at 500-600 deer.
1936	136	
1937	187	
1938	56	Deer population estimated at 200.
1939	43	Large increase in number of seedlings noted in the park.
1940	30	Good vegetative regeneration noted; estimated 50 deer in an enclosure erected by the Department.

The period from 1931 to 1940 witnessed the most intensive removal and control attempt in Rondeau's history. The herd size was apparently quite reduced by 1940. This management control effort, combined with a very destructive storm in 1934, created ideal regeneration conditions for all tree species.

1941		Major blowdown in September; 147 cubic meters salvaged, mostly elm and tulip.

TABLE 2: (cont'd)

DATE	NO. DEER SHOT	COMMENTS
1943		Beginning of a high water period.
1944	71	
1945	51	Excellent forest regeneration noted.
1946	12	Deer population estimate was 55.
1947	6	
1950		Major forest blowdowns experienced.
1951		Noticeable deer damage recorded; deer population estimate was 145.
1952	101	C.O. Bartlett study began; blowdown salvage efforts undertaken.
1953		Estimated 45-60 deer.
1954	52	Population estimated at various levels between 50 and 200.
1955		Population estimated at 200 deer.
1956		Hardwood regeneration noted as acceptable, but white pine suffering from browsing; Department salvaged 32,355 board feet plus 400 cords of fuelwood.
1957	3	Blue beech and ironwood cutting program introduced.
1958	10	Good hardwood regeneration noted; deer population estimate was 200; beginning of a period of low water. Bartlett's study published.

Even though the deer population was estimated to be low in the mid 1950s, resource managers recognized that deer census methods could be resulting in artificially low numbers and that the population could expand very quickly. The Department's district office in Aylmer recommended that 50-70 deer be killed annually, however, there was public opposition to this approach. In 1958, C.O. Bartlett concluded his five-year study and recommended that deer population numbers be maintained at 100 animals. He further recommended that the herd be cropped regularly without waiting for damage to forest regeneration to become evident.

TABLE 2: (cont'd)

DATE	NO. DEER SHOT	COMMENTS
1959	69	Public concern expressed over hunting; deer population estimate 100-200; most accessible vegetation had been eaten by the deer.
1960	33	Population estimate was 110.
1961	32	Pre-hunt population estimate was 115.
1962	44	Pre-hunt population estimate was 120.
1963	19	Pre-hunt population estimate was 125.
1964	4	
1965		Dead elms removed from roadsides.
1967	15	
1968		Noted that most mature elms were dead from Dutch elm disease.
1969	24	Population estimate was 135.
1970		Population was counted at 125.
1971		Population was 125 deer. Archery season proposed, but not approved.
1972		Browse survey by D. G. Driscoll suggested deer were over-browsing the forest. Population estimate 250-300 deer.
1973	40	Deer shot by MNR staff. 343 deer were counted. Park vegetation judged to be overbrowsed. Significant storm damage occurred in the forest. Interim deer management plan recommended 50 deer be harvested.
1974		Ontario Humane Society and University of Guelph agreed to tranquilize and remove 150 deer from the park. Project was a failure; after 650 man-hours of time seven deer were removed and the Humane Society

TABLE 2: (cont'd)

DATE	NO. DEER SHOT	COMMENTS
		withdrew from the project. Rondeau Advisory Committee began deliberations and public hearings.
1975		P. Pratt and R. Gray conducted a forest survey. The deer survey indicated 282 animals present.
1976		Major storm damage occurred; greatest losses were to red and white oak, white ash, basswood, hard maple, butternut and white pine.
1977		February deer drive recorded 387 deer. In March another ice storm brought down many trees. Rondeau Advisory Committee made a number of recommendations regarding the deer and the forest.
1978		Deer count cancelled due to bad weather; believed that deer numbers had increased. Deer exclosure study begun by Ken Yaraskavitch.
1979		Deer drive recorded 393 deer. Deer sand-track count indicated considerable daily movement of deer in and out of the park, with a net movement in for winter months.
1980		391 deer recorded. E.Haggith began Master of Forestry thesis project on forest structure and composition.
1981		Deer drive cancelled due to poor weather.
1982		Deer drive recorded an increase to 486 deer.
1983		Deer drive count cancelled due to early thaw. Ken Yaraskavitch completed his report on The Effects of Deer Browsing on Forest Succession in Rondeau.
1984		Deer drive count recorded 416 deer.
1985		Deer drive count recorded 386 deer.
1986		Deer drive count cancelled due to early thaw.

TABLE 2: (cont'd)

DATE	NO. DEER SHOT	COMMENTS
1987		Deer drive count recorded 332 deer.
1988		Deer drive count recorded 336 deer.
1989		Deer drive count recorded 489 deer.

N.B. All of the above-noted population control efforts involving the shooting and disposal of deer were directly carried out by staff of the Ministry of Natural Resources or its departmental predecessors or by individual marksmen hired specifically for this purpose.

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APPENDIX II

POPULATION DYNAMICS OF RONDEAU DEER*

1.0 INTRODUCTION:

Rondeau Provincial Park has a long history of high deer populations. However, very few measurements of population parameters, deer condition or reproductive performance have been taken. The lack of an annual harvest has precluded large samples of hands-on measurements. Fortunately, an annual survey, several indirect measurements and field observations do allow for an estimation of deer population dynamics.

The most intensive study of white-tailed deer ever undertaken was on the George Reserve, an area very similar to Rondeau and located 80 kilometres west of Windsor in nearby Michigan (McCullough, 1979). Forest type and climate are similar in the George Reserve. This reserve is entirely surrounded by fence while Rondeau is almost completely surrounded by water. Although the Rondeau deer herd has been found to be a resident population, some dispersal and immigration certainly does occur. Although the principles from McCullough's George Reserve study apply generally to deer populations elsewhere, the values should be especially comparable to Rondeau.

2.0 RONDEAU DEER DENSITIES:

Rondeau deer counts in the last 10 years have oscillated around 400 animals (see Figure A) in a manner similar to oscillation that occurs when populations are near year-round carrying capacity. (Carrying capacity is the maximum number of deer an area can support on a sustained basis). This estimate is taken from counts during January and February. Rondeau has approximately 11.0 km² of deer range for a density of 36 deer/km² if carrying capacity is 400. The George Reserve (4.6 km²) had 38 deer/km² at carrying capacity. Irruptions to higher densities near 450-500 are to be expected because of time-lags in density-dependent responses.

Summer carrying capacity is much higher than winter carrying capacity. Estimates of yearling antler beam diameters for Rondeau are 13-14 mm based on the occurrence of yearlings with antlers less than 3.5 cm long and observations of yearlings. A summer of 1985 fawn/doe survey showed a ratio of 0.7. Both of these measures suggest that the Rondeau herd is at about 40-50 per cent of summer carrying capacity.

Winter carrying capacity has not been directly measured in Rondeau although a survey in 1988 of woody twigs showed that primary productivity was extremely low in pole-timber and sawtimber stands (average 11 kilograms of woody twigs per hectare). It is also obvious that deer herds are above winter carrying capacity since some forest species are declining.

The principles of deer biology and management described earlier were used to construct a simple model to analyse Rondeau deer herd population dynamics. The model was run so that early winter populations would stabilize at just over 400 deer to correspond to winter counts. The percentage of summer carrying capacity achieved at stability was 50 per cent. The embryo rate per doe was 0.8 fawns. This corresponds to a summer count of about 0.7 fawns per doe (see Table 1).

Summer carrying capacity was estimated at 700 and winter carrying capacity at 350. At the beginning of the winter, herds were at 118 per

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* 1989. Dennis R. Voigt and J.D. Broadfoot. Co-operative Deer Study, Wildlife Research Section, Ministry of Natural Resources. Maple, Ontario.

cent of winter carrying capacity. In some years this would be even higher. A decline in forest regeneration is expected. Since deer selectively feed on some species of plants, it is not surprising that certain species are declining.

In order to reduce the herd to about one-third of winter carrying capacity so that regeneration can occur, the number of deer during the winter count would have to be about 125 (see Figure B) or about 120 at the end of winter. The herd could be stabilized by annually harvesting 60 deer during the fall or early winter (see Figure C).

Field data of winter browse were also used to estimate carrying capacity using a computer model called Deer Camp (Moen 1986). From these simulations a herd of 120 deer would consume 38 per cent of the annual productivity of woody plants as opposed to our population dynamics model which suggested 35 per cent. In either case, a herd reduction to 120 to 125 animals should allow ample forest regeneration since only 35-40 per cent of current annual growth would be consumed.

These figures differ only slightly from those of McCullough's George Reserve study which use a simpler year-round carrying capacity estimate. We believe Rondeau mortality is likely higher (road-kills, poaching, etc.) and some dispersal to the mainland is probable. Mortality of adults in Rondeau, based on our radio-tagged sample, is 12 per cent -- relatively low in comparison with mainland areas in Ontario (Co-operative Deer Study, OMNR) where it is over 30 per cent including an annual hunt. The mortality curves for Rondeau include fawns, bucks and the effects of dispersal and thus they show higher annual mortality than McCullough (see Figure D). Embryo rates versus year-round carrying capacity (K) are shown in Figure E.

The use of the Rondeau model showing winter and summer carrying capacity helps to illustrate the herd reduction required to allow regeneration. It also illustrates that an annual harvest is necessary in virtually all years. In a simulation of 100 years, a strategy of harvesting 60 deer each year showed that there were only seven occasions in which a harvest would not be necessary (see Figure F). Changes in forest structure, climate, sex and age composition of the herd would add considerable variability to this estimate. An annual count of the herd would be necessary to determine whether a harvest could be avoided in that particular year.

Table 1. Model Simulation of Rondeau Deer Herd - Summer K = 700
- Winter K = 350

YEAR	# DEER END OF WINTER	WINTER RECRUIT-MENT	FALL RECRUIT-MENT	3 WINTER DEER	% ANNUAL K	% WINTER K	% SUMMER K	# SPRING DEER
0	9	4	4	9	3	3	1	10
1	15	7	7	16	4	4	1	17
2	27	11	12	27	8	8	2	30
3	45	19	19	46	13	13	4	51
4	74	29	31	77	21	22	7	85
5	117	42	48	122	34	35	11	137
6	170	54	66	183	49	52	17	206
7	228	57	81	252	65	72	24	287
8	277	49	87	315	80	90	33	363
9	311	34	83	360	89	103	40	420
10	331	19	76	387	95	111	45	455
11	340	10	70	401	98	115	47	473
12	345	5	67	407	99	116	49	482
13	347	2	66	410	100	117	49	486
14	348	1	65	412	100	118	50	487
15	348	0	64	412	100	118	50	488

Fig. A. WINTER HERD SIZE VS % WINTER K

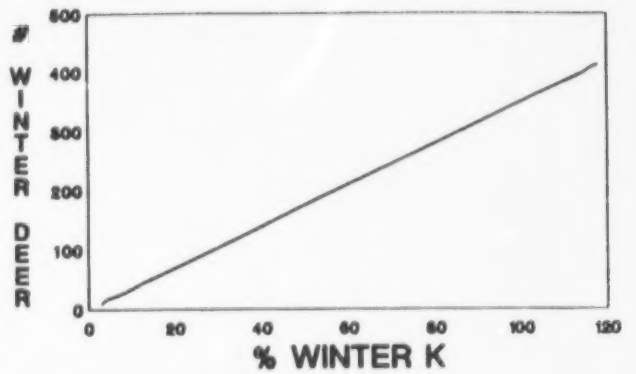


Fig. B. RONDEAU DEER COUNTS
$\bar{x}$ = 404

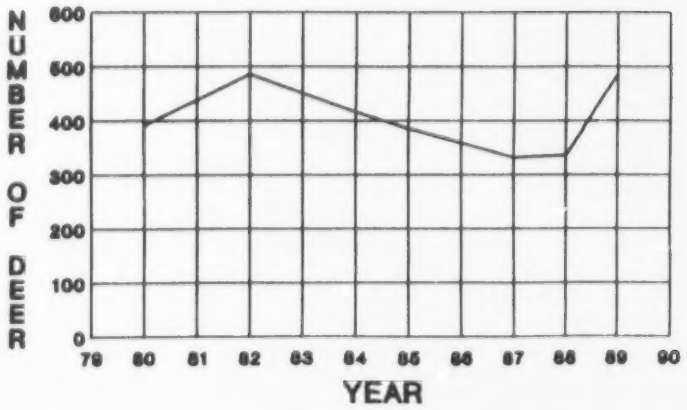


Fig. C. FALL RECRUITMENT

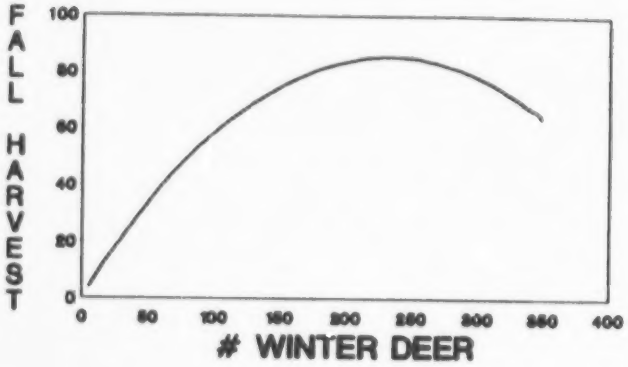


Fig. E. EMBRYO RATE

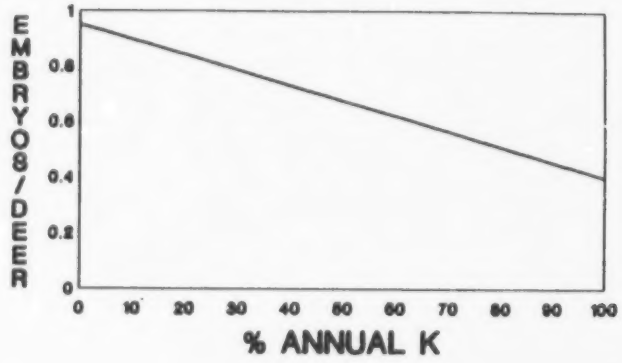


Fig. D. MORTALITY RATE

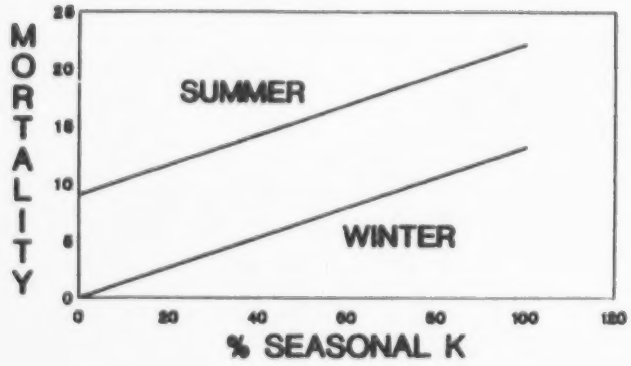
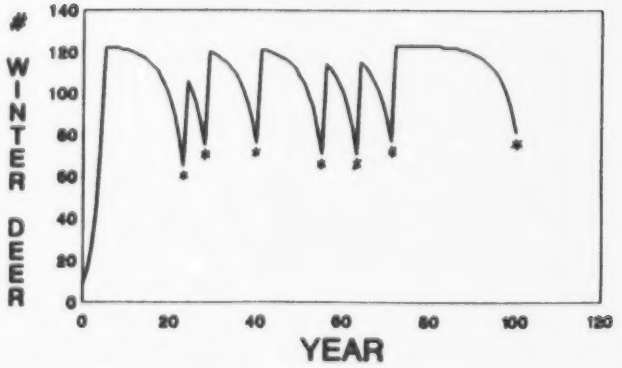


Fig. F. HERD TREND



* Indicates non-harvest year

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